December, 1946 Vol. 35, No. 10

PERIODICAL

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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Pre-Convention Number

When the heat comes from within

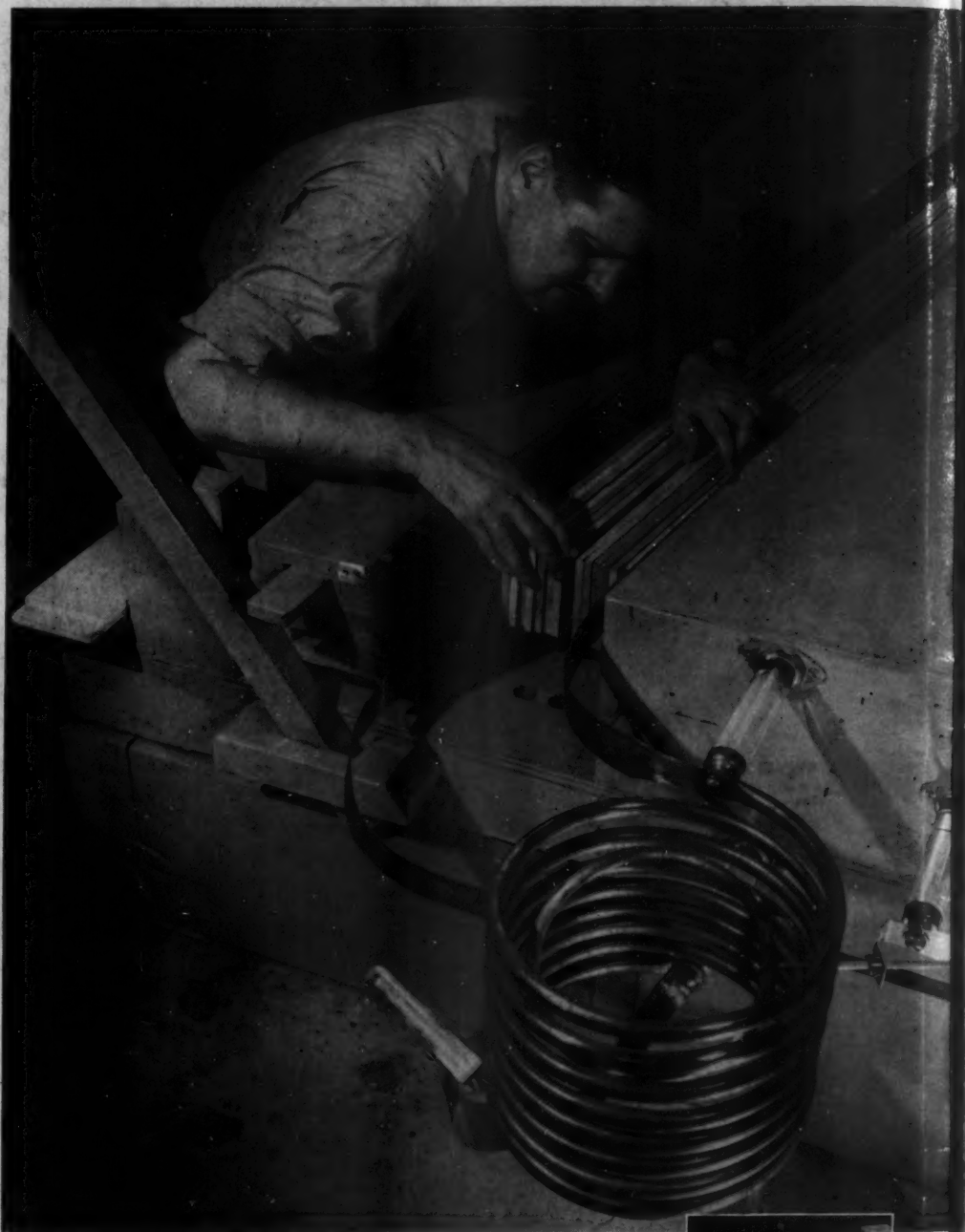
Applying heat to the outside of a material in order to heat it within is an inefficient method . . . slow, uncertain, wasteful—as technical men have always known. Hence their eagerness to seize upon a tool which science has newly given to industry . . . the tool of electronic heating which, by reversing a flow of electrons millions of times a second, generates heat *within* a material so rapidly, uniformly and efficiently as to revolutionize many processes, notably in plywood and plastics.

Many educators will be struck by a parallel here. They have seen how attempts to *coerce* a lad into right habits of thought nearly always fail of their purpose. Applying "heat" to a boy from the outside is more likely to arouse his resistance than his compliance. But when the heat comes from within, when the educator can kindle a flame inside the boy, it will inspire him with ambition for success, with uprightness of soul, with sublime sincerity . . . it will radiate outwards and guide all his actions toward his goal.

Anyone with a sense of modern psychology knows that seemingly trivial events and things can help strike the spark that kindles the flame within. The drafting instruments a boy uses when he first comes to mechanical drawing class are a good example. Actually, these instruments, sometimes so casually treated, are tools in the act and art of creation, of construction, of building and progress . . . instruments by means of which scientists and engineers gift the world with tall bridges, peering Palomars, the miracles of radar and fission, all the wonders of the Industrial Age.

Seen more sensitively and imaginatively, finely crafted instruments are things of beauty in themselves, perhaps more appealing and compelling to boys because their functional beauty is allied to practicality.

But beyond all these attributes, drawing instruments carefully chosen may help the boy find his road of personal salvation, attracting him to the disciplines of honest, consecrated work, inspiring him to a full gift of his energy and his talents to a needy world. Certainly such tools must be worth time and care in their selection. Certainly they should be worthy of the respect the instructor and after him the student should bring them. Can even the best be good enough?



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Simplify Teaching with SOUTH BEND LATHES

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9" Swing
3', 3½', 4', and 4½' Bed Lengths

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4', 5', 6', and 7' Bed Lengths

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Series 900—9" Swing
½" Maximum Collet Capacity
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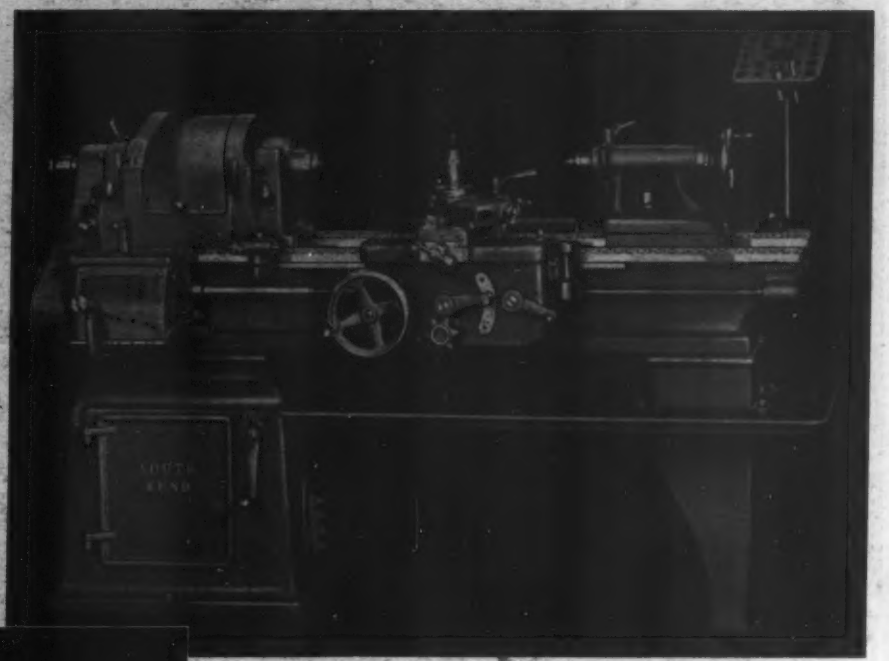
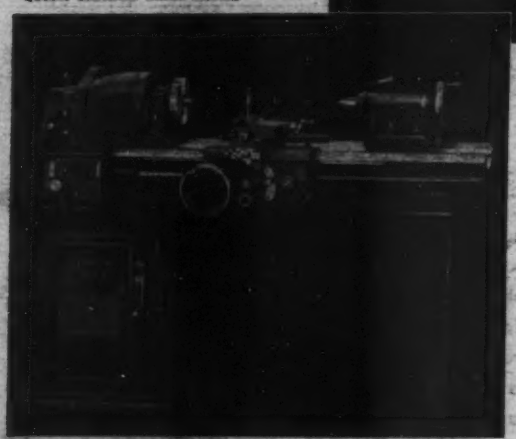


16" x 6' SOUTH BEND TOOLROOM LATHE

13" x 8' SOUTH BEND QUICK CHANGE GEAR LATHE



9" x 3' SOUTH BEND MODEL A BENCH LATHE

The outstanding records for performance and dependability that South Bend Precision Lathes have achieved under the critical demands of American industry recommend them for student training purposes in the school shop. These essential lathe qualities—performance and dependability—plus ease of control, simplicity of operation, unfailing precision, unusual versatility, and built-in safety features, make South Bend Precision Lathes the logical installation for those school shops where the quality and thoroughness of training are principal considerations. Certainly, too, it is to the students' advantage to learn in school to operate the lathes which they are most likely to use in industry. Write today for Catalog 100-D which illustrates and describes all South Bend Precision Lathes.

A. V. A. CONVENTION

See the factory display of South Bend Lathes during the Convention of The American Vocational Association, Hotel Jefferson, St. Louis, Mo., Booth No. 50, December 4 to 7.

TEACHING HELPS FOR SHOP CLASSES

Manuals, sound films, wall charts, booklets, and other teaching and study helps on the operation and care of metal working lathes are available to shop instructors, supervisors, and trainees. Write today for free Bulletin No. 21 which illustrates and describes this valuable educational material!

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FOR every nut turning operation there is a Snap-on wrench *engineered* to do the job better, faster, with greater accuracy and safety. *Training with Snap-ons* . . . encouraging students to develop the speed, dexterity and confidence which these modern tools invite . . . is an important factor in training capable mechanics.

Write for catalog of 3,000 Snap-on tools.

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PEXTO MACHINES HELP TRAIN THOUSANDS FOR SKILLED JOBS

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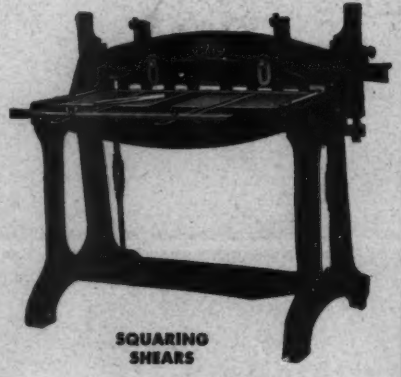
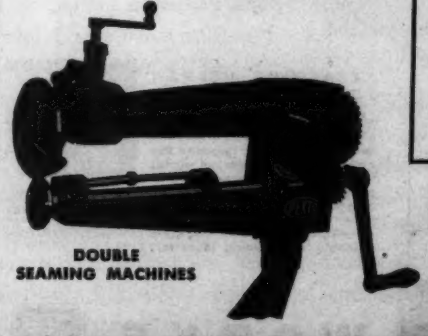
PEXTO pioneered in bringing the best in sheet metal fabricating machinery to vocational schools. Former students, now craftsmen in the trade, find the majority of shops use PEXTO products for better, faster work at the greatest saving in man hours. Back of all this is a tradition that insists on accuracy, sturdiness and dependability of each and every unit.



SQUARING SHEARS



DOUBLE SEAMING MACHINES

Supervisors And Instructors Write for Bulletin 5B-35

FOLDING MACHINES

THE PECK, STOW & WILCOX COMPANY *Since 1785* SOUTHINGTON, CONNECTICUT, U. S. A.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, December, 1946, Volume 35, No. 10. Published monthly, except during July and August, by The Bruce Publishing Co., Milwaukee 1, Wis. Entered as Second-Class Matter January 2, 1914, at the Post Office at Milwaukee 1, Wis., under the act of March 3, 1879. Subscription price in the U. S., Canada, and countries of the Pan-American Union, $2.50 per year; Foreign, $3.00; Single copies, 35 cents.

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Book One
RIGHT AND WRONG IN MILLING PRACTICE

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The famous Kearney & Trecker "Milling Practice Series" of three great books is yours for the asking!

They show you with simple drawings and photographs the "Do's and Don'ts" of milling machine care, set-up and operation. They tell you what a milling machine is, its numerous types and what it can do. They show you various methods of cam milling. These handy, pocket-size books are an invaluable aid to students, trainees, instructors and operators alike. Send for yours today — no obligation. Dept. VE12.

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Excerpts from an

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Much credit is given to Petrik's electric tunnel kiln, equipped with GLOBAR heating elements, for the delicate line and colorful beauty of Royal Petrik Ware.

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John Petrik, formerly of Budapest, now of Niagara Falls, N.Y., has given his name to Royal Petrik Ware. The steadily increasing public demand for the products of his kiln is a solid tribute to his artisanship.

The regal crest which stamps Royal Petrik creations is becoming an increasingly familiar symbol of the finest in art china. Contributing to the growing success of these products is the method of electric kiln heating employed.

According to Mr. Petrik, through the use of GLOBAR electric heating elements, "There is an overall simplification of operation and maintenance that does away with the necessity of special saggers or muffles and allows the kiln to be operated with the minimum of effort and waste."

Mr. Petrik states further, "We have found that, in the manufacture of our high quality Art China, the use of the GLOBAR type of electric kiln heating has proved to be one of the most economical, in comparison with the other usual firing methods. This economy is effected by the reduction of our fire damage loss which we have been unable to obtain until installing GLOBAR elements."

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These are statements by an acknowledged expert in the profession. They echo the experience of all those who are using GLOBAR heating elements. They support the claims we have made for this modern method of kiln heating.

GLOBAR heating elements are giving important advantages to forging and heat treating applications as well as ceramic firing. For complete details, write directly to The Carborundum Company, Globar Division, Niagara Falls, New York.

GLOBAR Heating Elements
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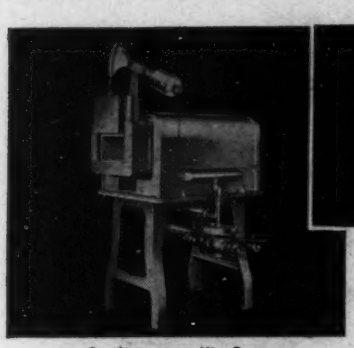

Small Semi-Muffle Oven

Sunbeam STEWART

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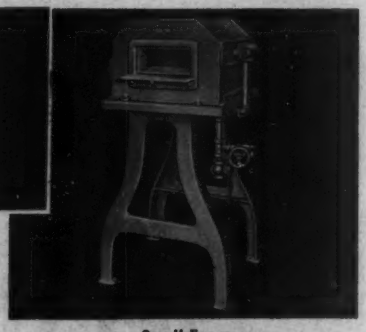
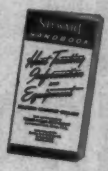
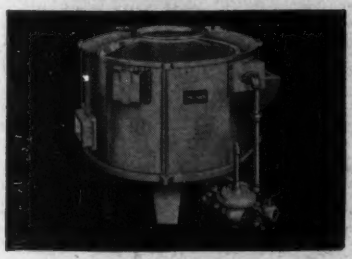


Small Forge

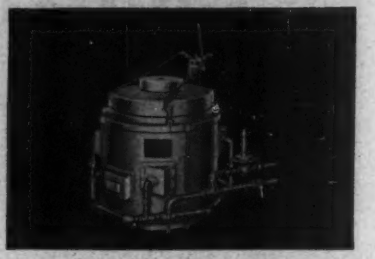
HUNDREDS OF THESE SUNBEAM STEWART FURNACES ARE IN THE VOCATIONAL DEPARTMENTS OF TECHNICAL SCHOOLS

Because Sunbeam Stewart units have been designed for efficient production heat treating in small shops and tool rooms, they are widely recognized as standard equipment for all types of industrial heat treating and vocational training work. For student instruction and reference with further details on Sunbeam Stewart Furnaces especially suitable for school shop use, write for our free "STEWART HANDBOOK of Heat Treating Information and Equipment." Also the new Sunbeam Stewart DATA FILE on school units.





Round Pot Furnace



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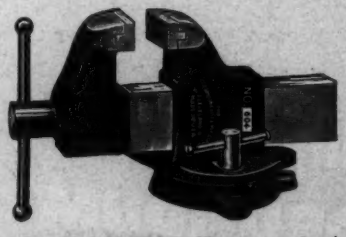

Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

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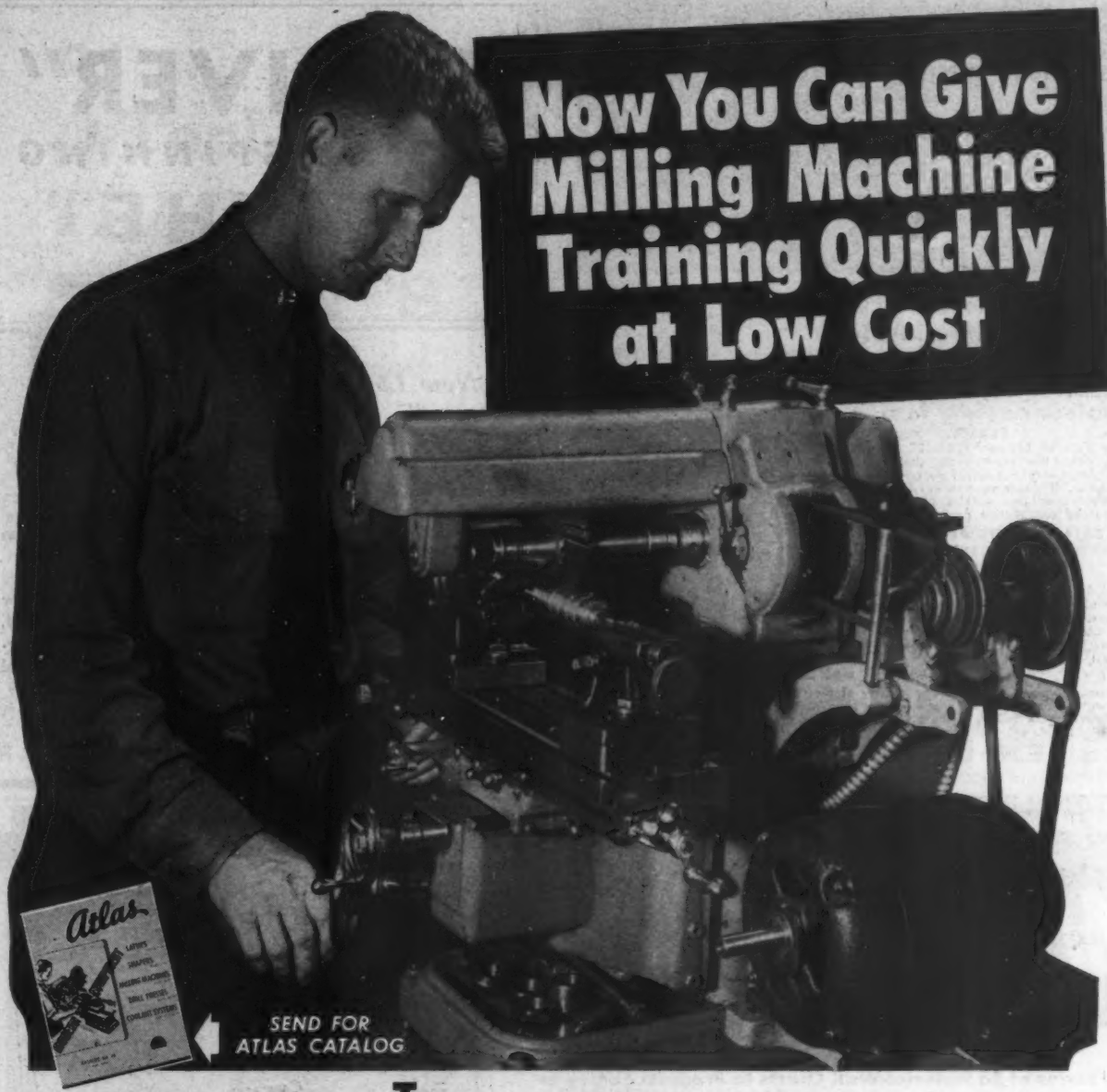

TIME spent with a milling machine is a valuable asset for any student who takes a job in today's skill-hungry industry.

The Atlas milling machine, quick and easy to set up and operate, helps you include milling instructions in a tight class schedule. Its compact design — with all the versatility of large machines — enables students to grasp the operating fundamentals in a remarkably short time.

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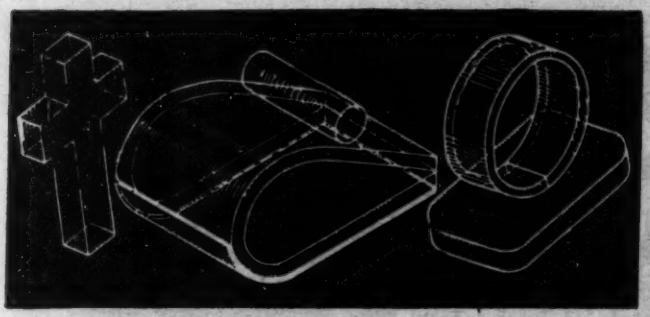
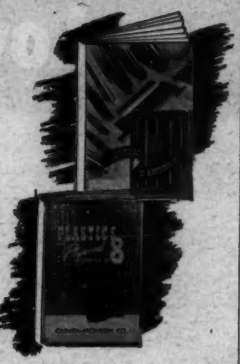


YOUR STUDENTS WILL LIKE PROJECTS IN PLASTICS

Plastics are simple to cut, shape, carve and dye. With easy-to-learn skill, your students can produce professional-appearing projects that will win exclamations of admiration from their friends and parents.



HANDBOOK TELLS HOW TO FABRICATE PLASTICS

The new Carmen Bronson PLASTICS HANDBOOK describes in detail the professional techniques of fabricating Plexiglas, Lucite, Bakelite, Polystyrene, Lignolite and other plastics. It discusses business opportunities in the plastics field; and gives working plans for many simple and advanced construction projects.

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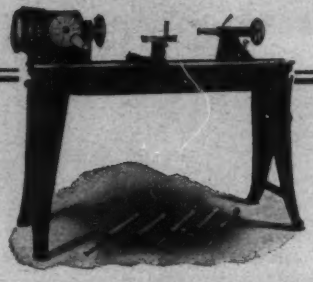

This New Lathe is a "must" for progressive shops . . .

Instructors in today's busy shops find this "Oliver" Lathe a most useful and valuable addition to their equipment. Students quickly learn to spin practical articles of surprising beauty from pewter, aluminum, bronze, etc. Its smooth flow of power spins 20-gauge steel with ease. Has heavy bed, extra large bearings, live tail center. Ball bearing, motor-driven headstock adjustable from 800 to 2400 RPM. And for turning wood there isn't a lathe that can beat it.

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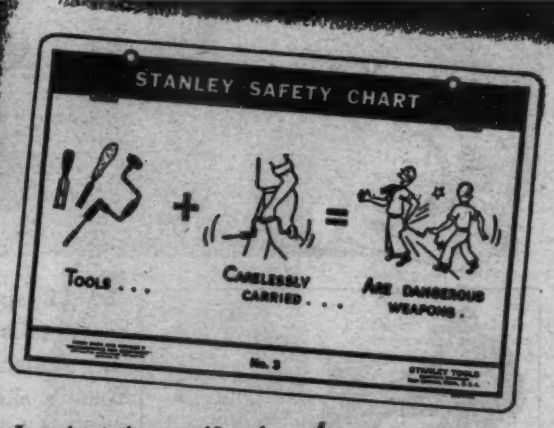

A Series of 36 Pictorial Wall Charts to Promote Safety in the Use of Tools and Machines in School Shop

It is important that your students—the skilled tool users of tomorrow—be trained in ways of safety as they learn the use of tools and machinery. These charts put this idea across with simple, graphic emphasis. To promote safety in schools, as well as in future work, Stanley offers this series of charts at cost of printing and postage. No finer investment could be made in school shop training. ORDER A SET TODAY!

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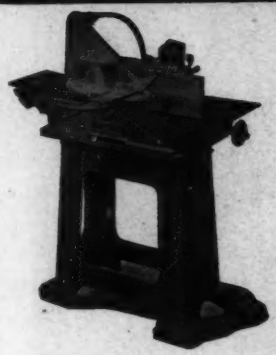

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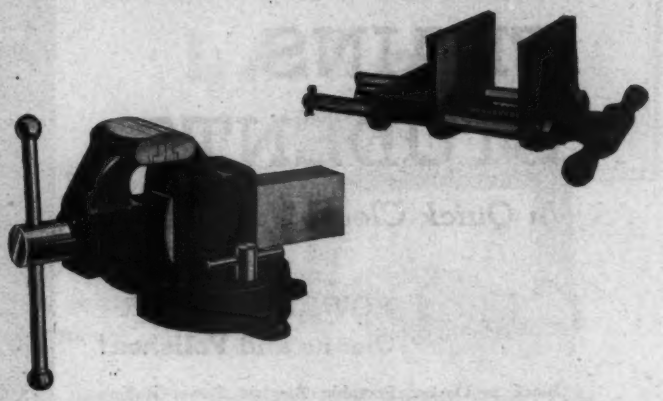

For more than thirty years Morgan Vises have given dependable service to school and industrial shops. Built of the best materials and workmanship, Morgan Vises will "do their bit" in your shops.

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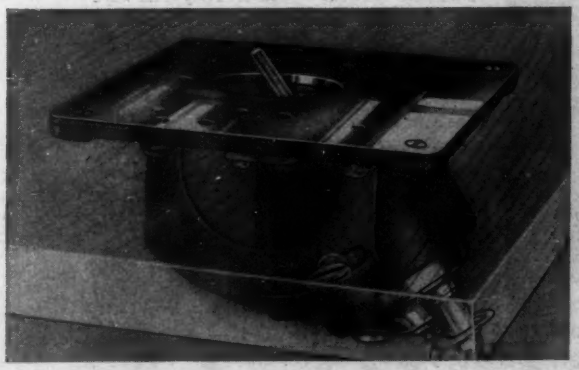
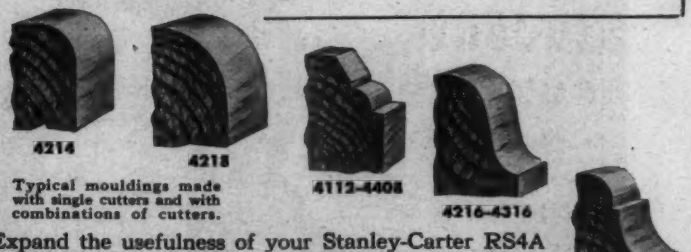
MAKE your RS4A HAND SHAPER into a BENCH SHAPER that turns out professional quality mouldings and decorative furniture edges





4214 4218 4112-4408 4216-4316

Typical mouldings made with single cutters and with combinations of cutters.

4408-4316

Expand the usefulness of your Stanley-Carter RS4A Hand Shaper with this inexpensive Bench Shaper Plate. Uses only one end of a bench: doesn't interfere with other uses of bench. Easy to install. Just mortise out recess for flush mounting of plate, cut opening with compass saw for shaper shaft and mount with four screws. Tilt adjustment gives any angle up to 45° and every angle gives a different cut with the same cutter or combination of cutters. Complex moulding and decorative cuts made smoothly, easily and safely. Send coupon for full particulars.

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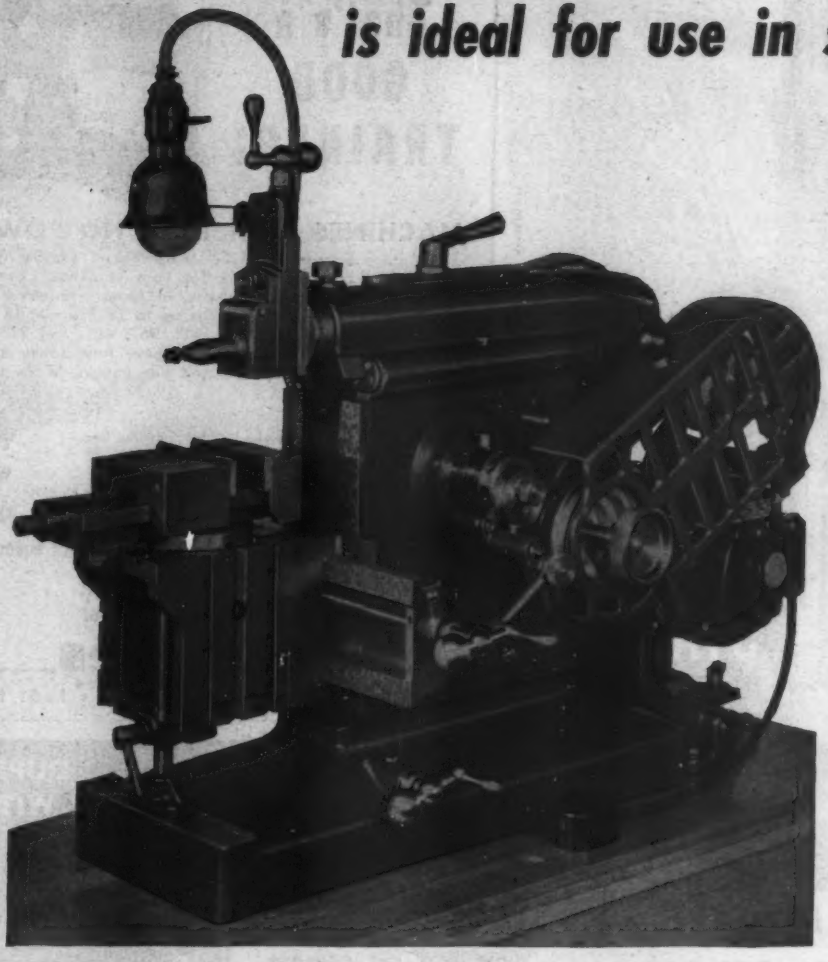

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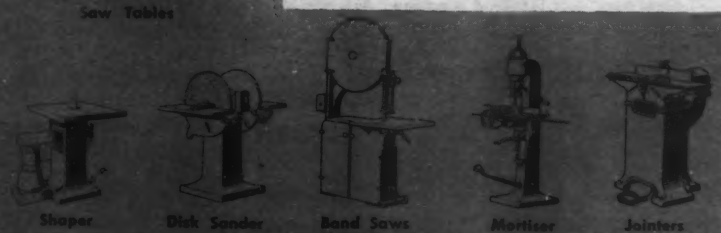

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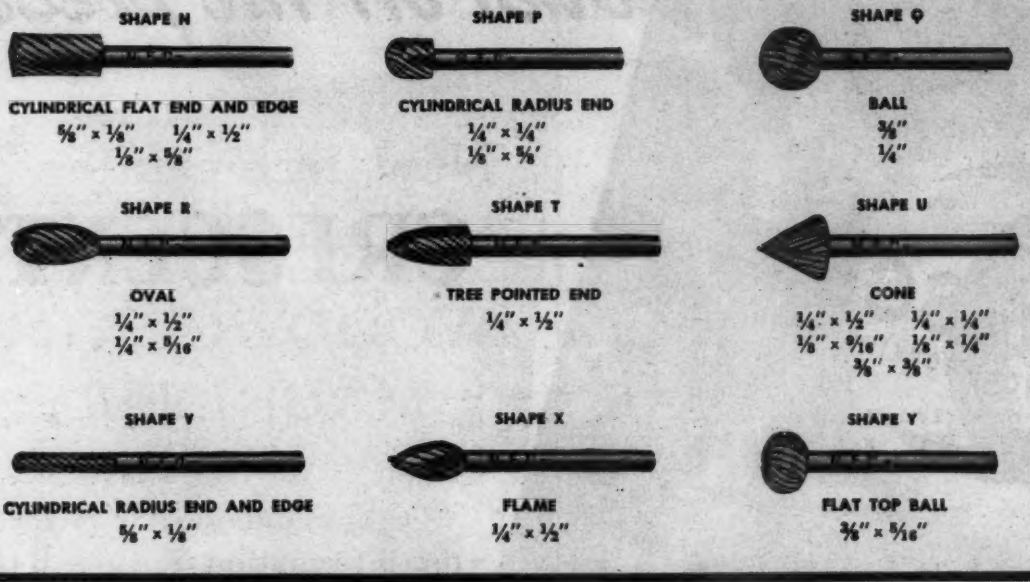

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St. Louis, Host to the A.V.A.

St. Louis, the city in which will be held the American Vocational Association convention on December 4, 5, 6, and 7, is the eighth city in point of population in America.

It is one of the great commercial centers of the United States and is a focal point for transportation and travel from all directions. It started as a French trading post in 1764, was taken over by the Spaniards in 1770, and by the United States in 1804.

St. Louis is well known as a wholesale and manufacturing center; as a source of supply of raw materials of many kinds; as an important market for livestock, grain, cotton, hides, skins, furs, wool, and lumber; and as a producer of drugs, tobacco, ceramic products, shoes, stoves, and machinery.

It is a city rich in historic interest, and has many public and private educational institutions which may be visited by those who attend the convention.

The city is all prepared to receive us; let's plan to be there in large numbers.

The March of Dimes

Bulletins of the U. S. Public Health Service show an increase of infantile paralysis cases over last year. Be generous with your "March of Dimes" donation. Remember the 1947 drive is scheduled for January 15–31, 1947. Help the National Foundation for Infantile Paralysis, Inc., 120 Broadway, New York 5, N. Y., assist those little sufferers who are the principal victims.

This Month's Cover

The cover picture shows a student in the air conditioning class, servicing a commercial cooling unit at the David Ranken School of Mechanical Trades, St. Louis, Mo.

Coming Conventions

November 24–27. South Dakota Education Association at Sioux Falls, S. Dak. S. B. Missen, secretary, Sioux Falls, S. Dak.

November 25–27. New Mexico Education Association at Albuquerque, N. Mex. R. J. Mullins, secretary, 114 Marcy St., Santa Fe, N. Mex. Headquarters, Hilton Hall.

November 29. Virginia Vocational Association at Richmond, Va. Headquarters, John Marshall Hotel. Miss Nettie Yowell, secretary, State Department of Education, Richmond, Va.

December 2–3. National Association of State Directors of Vocational Education at St. Louis, Mo. J. Seidel, secretary, 1111 Lexington Blvd., Baltimore, Md.

December 4–7. American Vocational Association at St. Louis, Mo. L. H. Dennis, 1010 Vermont Ave. S.W., Washington, D. C., in charge.

December 26–28. Illinois Education Association at Springfield, Ill. Headquarters, Elks Club. Irving F. Pearson, secretary, 100 E. Edwards St., Springfield, Ill.

December 26–28. Pennsylvania State Education Association at Harrisburg, Pa. Headquarters, Penn Harris Hotel. H. E. Gayman, secretary, 400 North Third St., Harrisburg, Pa.

Industrial Arts and Vocational Education

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Industrial Arts and Vocational Education in St. Louis

*Warren K. Begeman**

The American Vocational Association Convention to be held in St. Louis on December 4, 5, 6, and 7 should be profitable and pleasurable for those who attend. St. Louis, long popular as a convention city because of its accessibility, its facilities, and its hospitality, has much to offer in a concrete way to those interested in industrial arts and vocational education.

Industrial-arts work has been in the St. Louis public schools since 1899, when Dr. Calvin Milton Woodward, originator of the manual training movement in the United States, obtained, while a member of the St. Louis board of education, a contribution of $500 from a philanthropically minded family, with which to establish a "wood" shop in the L'Ouverture School. Other members of the board hesitated to accept the gift since they did not know where funds to carry on the activity in ensuing years could be secured. However, Dr. Woodward's will "to develop the whole boy" prevailed and the shop was established at the L'Ouverture School to serve boys in grades 7 and 8. The success of the shop was such that principals in neighboring grade schools asked permission of the board to send their grades 7 and 8 boys to the shop for one and one-half hours each week.

Thus, the industrial-arts center program began to grow until today there are 23 centers serving the seventh- and eighth-grade pupils from 103 elementary schools.

The aim is to teach pupils how to plan, how to use the common tools properly, and how to select wisely the materials to do a job, thereby developing clear thinking, accurate and tidy performance, and genuine pride in finishing the job.

In order to increase the effectiveness and value of the program, a committee of teachers has made it the object of study and research for the past two years with revision of the course of study in mind.

It is intended that industrial arts be brought into each school, if possible, with a greater time allotment than at present. This arrangement should give pupils more opportunity to tie up shop experiences with their daily school activities. Also the industrial-arts teacher should become a greater influence with more time to know and advise his pupils. He would be in a position to give some consumer education.

To this end, the following proposals have been presented lately by the superintendent of instruction to the planning committee of the St. Louis board of education:

Kindergarten — Grade 6

"It is proposed to make available practical arts (industrial arts and homemaking) facilities in each elementary school for children in grades kindergarten through grade 6 so that the regular teacher may have the opportunity for coordinating this type of work with the work of other areas."

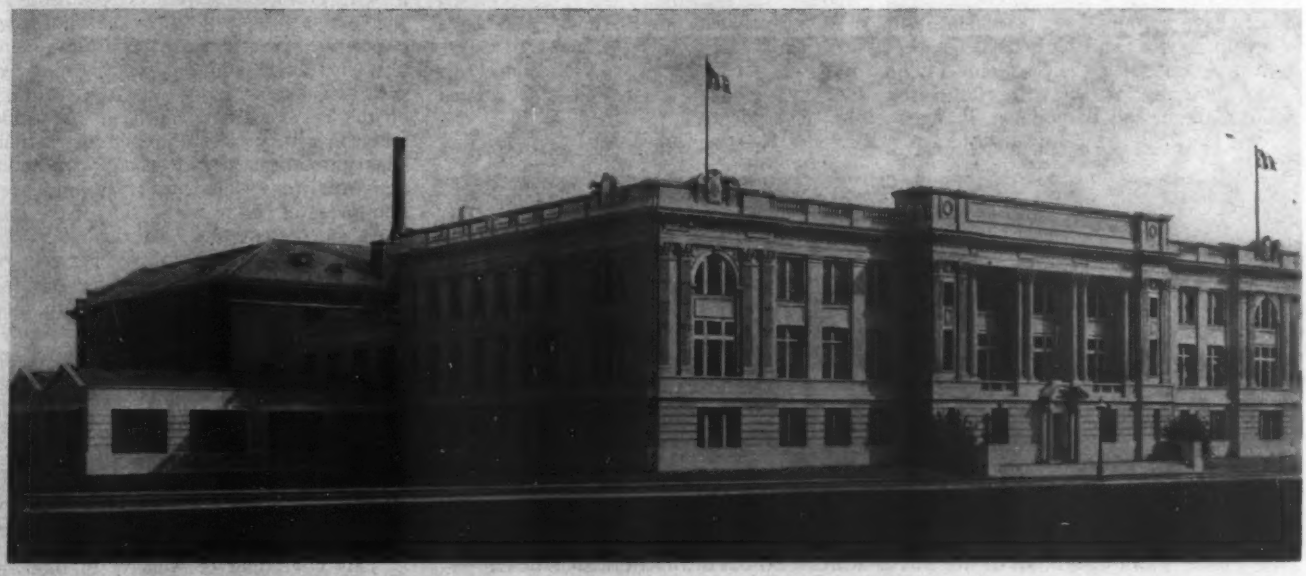
Grades 7 and 8

"It is further proposed to provide Grades 7 and 8 with facilities for homemaking for girls and industrial arts for boys, with provision that certain aspects of industrial arts be made available for girls as girl groups, and certain aspects of homemaking be made available for boys as boy groups, all this to be based on the course of study. This work to be offered under special teachers.

"These facilities will be available in each school. It may be necessary in the case of small schools to set up an arrangement whereby these facilities would be available in only one of several schools."

In the St. Louis high schools, industrial arts, once embodied only in definite manual-training courses, is now offered as an elective subject in any term of grades 9 to 12 inclusive. Mechanical drawing and shopwork may be pursued separately.

*Director, Technical Education and Industrial Arts, Board of Education, St. Louis, Mo.



David Ranken School of Mechanical Trades

Hadley Technical High School

Booker T. Washington Technical High School

The drawing courses, offered seven periods per week, are mechanical drawing 1 and 2 followed by architectural drawing 1, 2, 3, and 4, or machine drawing 1, 2, 3, and 4. Then home planning 1 and 2 may be elected. The shop courses, offered seven periods per week are woodwork 1 and 2, and patternmaking and molding. Machine tool practice 1, 2, 3, and 4 is given ten periods each week to pupils above grade 10.

St. Louis boasts two excellent four-year course public technical high schools — the Hadley Technical High School and the Booker T. Washington Technical High School, the latter for Negroes. Both schools meet the standards set up by the State and the United States Offices of Education. They both offer technical, industrial, and commercial courses to elementary school graduates who have been recommended for secondary school training and to students, who having completed some regular high school work, enter with advanced standing. Programs are also adapted to the needs of high school graduates. Both schools have a counseling, placement, and follow-up service, and both have co-operative programs with the St. Louis Public School colleges, Hadley with the Harris Junior College, and the Booker T. Washington Technical High School with the Stowe Junior College. Thereby, high school graduates are able to supplement their general education programs with job preparatory training.

In both schools occupational guidance is stressed in grades 9 and 10 through prevocational courses. Individual differences are cared for, and the capacities and aptitudes of students studied in order that the students may be directed into vocational activities suitable to temperament and ability.

To earn a diploma in either school, a student must complete satisfactorily the requirements of his course plus three years of English, one year of mathematics, one year of science, and three years of social studies, the latter comprising civics, industrial geography, industrial relations, sociology, economics, world history, and American history (one year required).

At Hadley the social studies and English classes have been integrated, subject matter and teaching methods being adapted to the needs of the students.

The technical high schools also have extracurricular activities, such as music, athletic and character-building clubs, and student publications, edited and printed by the students.

Power plant operation at the David Ranken School of Mechanical Trades, and engine tune-up instruction at Hadley Technical High School

There are various branches of work in the technical high schools. For example, at Hadley are the following: (1) all-day trade preparatory education; (2) apprenticeship part-time education; (3) adult education; (4) tutorial education; (5) co-operative education; (6) veterans' training program — (*a*) academic high school training, (*b*) trade training.

The all-day trade preparatory education prepares boys and girls to enter specific jobs in commercial or industrial work. The commercial courses are the bookkeeping, general clerical, and stenographic. The industrial courses are the aeromechanics, auto mechanics, commercial art, cooking, tearoom service, cosmetology, drafting (architectural and machine), electricity, garment trades sewing, machine shop, photography printing, radio service and repair, welding, and woodwork.

Stress is laid on the related subjects which include trade information, trade mathematics, and trade science. These and the vocational subjects must be carried with an average of at least 80 per cent.

The apprenticeship part-time education meets the Missouri State Vocational plan. The instructors are skilled journeymen with actual trade experience; the members of the classes are engaged in the trade for which they are receiving instruction. The apprentices attend school four hours per week for related trade training, for knowledge of the technical side of the job.

At the present time, veterans of World War II make up a very large per cent of the enrollment in the apprentice training classes at Hadley. Being more mature, they appreciate what is being done for them.

There are 72 classes for indentured apprentices, some held in the day and some in the evening. These are classes for asbestos workers, bricklayers, carpenters, electricians, glaziers, furniture finishers, lathers, machinists, meat cutters, patternmakers, painters, printers, sheet-metal workers, steam fitters, tool and diemakers, vehicle painters.

This upgrading of workers in industry is made possible by the co-operation be-

At left — Interior decorating in the painter's apprentice class, and at right, applied science course at Hadley Technical High School

tween the school, labor, and the employers.

Adult education permits adults to obtain instruction in a large selection of subjects. Some classes meet during the day; some during the evening, usually for four clock hours per week for 24 weeks. Effort is made to present subject materials that meet the needs of persons enrolled in the classes. Employed persons find opportunities in industrial and commercial education for either afternoon or evening to suit the student's convenience. Completed contracts are each followed by a comprehensive written examination.

Applicants for tutorial instruction must be 18 years of age or older, and must present evidence of graduation from the eighth grade and a record of high school subjects completed, if any. The beginning student is permitted to carry only one subject until he has demonstrated that he has ability and time for study. Then he may enroll in two courses simultaneously.

The tutoring instruction has been very successful at Hadley. It has proved advantageous to the individual student who has found satisfaction in learning for its own sake as well as for the credits earned. It has been particularly helpful to persons who found a need for higher educational qualifications in order to advance in their work.

Co-operative education makes it possible for students of the regular high schools to supplement the general education with technical training at Hadley. The "co-op" students attend their own high schools for half a day, and Hadley for the other half. They are granted credit for the vocational work toward a general high school diploma. The principal purpose of this program is to prepare for employment by graduation time. Training that can be given in short unit courses is restricted to those in the last term of high school. Training for employment which requires more than one term is arranged for students 16 years of age and over, with the consent of a regular high school principal.

The program has shown a growth, with co-operative students registered in almost every department of the school and representing all the high schools. There are a number of co-operative students attending Hadley on a two-year basis, thereby developing marketable skills with their general education.

Hadley was selected as a place for the veterans' high school groups because of its central location. The academic division of the veterans' training is separate from the technical courses offered veterans at Hadley also.

The trade subjects offered are noncredit and designed for veterans who wish to enter the trades. At present a 48 weeks' course for radio repairmen and a 48 weeks' course in drafting are in progress. These courses are 80 per cent shopwork and 20 per cent trade information. The instructors are competent journeymen in the trade in which they are engaged to teach. Other trade courses will be developed as soon as sufficient demand is apparent.

Industrial-arts courses in the St. Louis public schools

to increase their vocational skill and efficiency. High school credit classes enable persons who were forced prematurely to leave regular high school to finish their educations and to receive the high school diploma.

The tutorial education provides instruction in academic subjects at high school level, covering the maximum requirements of the curriculums of the day high schools. The method used is individual instruction. Each pupil sets his own rate of accomplishment. He completes *contracts* equivalent to work covered in the regular day high schools either at school under the supervision of the teacher, or at home with weekly personal conferences with the teacher. A conference may be scheduled

Industrial-arts courses in the St. Louis public schools

Shoe repair and tailoring courses at Booker T. Washington Technical High School

have completed at least an eighth-grade education.

Evening classes are available to employed workers. Instruction is limited to the mechanical trades, including: air conditioning, automobile repair, carpentry, drafting, electricity, machine-shop practice, painting, patternmaking, plumbing, power plant operation, radio and television, refrigeration, sheet metal, and welding.

A recent development is the installation of a lithographic department which is nearing completion.

The school has a large number of veterans in day and evening classes. Full-time day enrollment is in excess of 900 students and some 1500 are in attendance in the evening classes.

Cosmetology course and general office training course at Hadley Technical High School

Veterans, residents of St. Louis, who desire credit for academic high school studies to obtain a high school diploma or to complete college entrance requirements are admitted to a course designed for veterans on either full-time or part-time attendance. The method is one of individual instruction, supervised study at school, plus home study. Written tests and final examinations are given at the school. The student's progress depends upon his ability, ambition, time, and willingness to study.

Credit is allowed for work certified by any approved high school and also for certified specialized training in military service or in the Armed Forces Institute.

Beginning in June, 1941, the war production training was carried on at Hadley and at Booker T. Washington for 24 hours a day. Some 75,000 workers, men and women, received instruction, while 6342 sailors were given 16 units of 38 hours each in ship electrical maintenance. Also 900 army signal corpsmen were given instruction in signaling. The schools also supervised in-plant-training programs.

The Washington Technical High School has the various types and divisions of training already outlined. It has technical, industrial, and commercial curriculums for boys and girls, adults, and veterans, preparing for skilled and technical positions in industry and in commerce.

The technical courses offered are: automobile mechanics, barbering, cafeteria management, commercial art, cosmetology, dressmaking and design, electricity, home management, industrial sewing, machine-shop practice, printing, radio mechanics, sheet-metal, shoe repair, welding, and woodworking.

The commercial courses offered are bookkeeping, commercial law, office practice, shorthand, typewriting, and secretarial practice.

For the day-school students the work is laid out primarily into four four-year curriculums — the technical the industrial, the secretarial, and the general business. However, each curriculum is flexible, and the general education is so combined with the vocational that a student completing the four-year course and maintaining a high average is in a position to work as a skilled mechanic or to continue in college the subjects pursued at the Booker T. Washington Technical High School.

Seniors in their last term in both technical high schools are permitted to work in industry on the half-day basis. They work on jobs pertaining to their major fields and receive credit for this work experience.

Both schools have built up good will in the community, and have maintained a close relationship with industry. The schools have carried on the training under practical on-the-job conditions, their shops fitted with factory type machines and necessary materials. Production work has been used for developing skills. Standards of competency have been upheld and proper social and vocational attitudes and habits have been fostered.

The David Ranken, Jr., School of Mechanical Trades, one of the early educational institutions providing practical education, is another asset to St. Louis. The school, one of the finest of its kind, was founded in 1907 by the late David Ranken, Jr., who left approximately three million dollars to endow a school to "dignify labor." Others have added to the endowment until it now totals more than four million dollars. The school is open to young men 16 years of age or over who

The school makes use of numerous visual aids.

The first superintendent of the school was Lewis Gustafson. He was a pioneer in vocational education and the first treasurer of the American Vocational Association.

The Ranken School joins the public schools in welcoming the American Vocational Association.

THE LEADERS

Leonard E. Schmidt*

As you watch your boys as they attempt
To do the things you do,
And ape each move that you may make,
Has it occurred to you
That you hold the power to set their ways
Along the paths ahead?

It's a privilege each teacher has,
An obligation too,
For what they learn, and what they do
Depends a lot on you.
So take a little extra care
With those who follow in your stead.

Think more than once before you act,
Weigh every move you make,
Forget not for a moment that
Their futures are at stake.
Then later you may proudly say,
"They followed where I led."

*Lincolndale, N. Y.

Foremanship Training and the Conference Method

H. W. Paine *

A knowledge of foreman conference work and its procedures naturally interests everyone concerned with adult education, and it is of particular interest to all educational directors in industry who are charged with foreman and employee training responsibilities. For this reason, the techniques of conference leading should be familiar to all shop and classroom teachers, especially those on the junior and senior high school level. They will find it an excellent tool to supplement the socialized lesson techniques when it is necessary to establish rules of conduct in the shop or classroom, to develop improved class routines, or to correct elements of school morale that are breaking down. Accordingly, the following material describes briefly the various types of foreman conference activities being carried on in America and outlines the procedures usually followed in setting up conferences. It also describes in detail the conference method and its techniques, and points out various applications and adaptations that can be made in high school shop and classroom teaching where, as in adult teaching, its chief value lies in the fact that the decisions reached and the plans agreed upon are *those of the group*, not *those of authority*.

Background of Foreman Training and the Conference Method

Foreman training programs have been one of the most successful activities carried on by the various vocational agencies of the nation ever since the establishment of vocational education on a nationwide basis by the passage of the Smith-Hughes Law in 1917. One needs to do little research to determine the reasons for this success. Foreman training services of many kinds meet educational needs that are untouched by any other agency, for truly the foreman is the "forgotten teacher" and a greatly neglected, though vital, minor executive in America's complicated industrial picture. Strangely enough, the conference method seems to many to be a new twentieth-century approach in educational procedures; however, Socrates would have recognized at once its pooling procedures and its possibilities for guiding youths and adults to logical conclusions systematically, efficiently, and surely.

Leaders in the Movement. In the early days of the movement, foreman training and the conference method were blessed by not one but two dynamic personalities whose enthusiasm, vision, and energy were destined to play outstanding roles in launching this activity successfully. One of these men, the late Charles R. Allen, revered by all of us in vocational education as the acknowledged leader of the movement in its early formative days, left a legacy to foremanship in his text, *The Foreman and His Job*,[1] written in 1922 when he was special agent of the federal board for vocational education. This text with its analysis of the foreman's job and training needs established the fundamentals of foreman training just as his earlier text of 1919, *The Instructor, the Man, and the Job*,[2] laid the foundations for the professional training and upgrading of all vocational teachers.

Another early leader whose forceful personality is still promoting the cause of foreman training and who can rightfully be said to have crystallized the art and science of conference leading is Frank Cushman, consultant in vocational education, U. S. Office of Education. His text, *Foremanship and Supervision*,[3] first published in 1927, has run through several editions. It lays down the principles and explains the techniques of conference leading. His firm belief in the worth-whileness of the movement, his energy and ability to demonstrate its techniques and to arouse enthusiasm in others have contributed immeasurably to the phenomenal growth of this branch of adult training.

Many volumes have been written regarding foreman training since these early texts were produced, manuals and suggestive outlines have appeared in great numbers, and private agencies have offered volumes of printed matter regarding conference methods and content — some good, some bad, and some indifferent as to the quality and practicability of the materials presented — but Allen's *The Foreman and His Job* and Cushman's *Foremanship and Supervision* laid the groundwork for the entire conference movement; they clearly delineated the problems, the procedures, and the techniques that must be followed in successful foreman training and in successful conference leading.

Contributions of Foreman Training. Foreman training has undoubtedly made major contributions to effective industrial leadership in America during the past quarter of a century. Its history includes many interesting chapters. War-developed variations of foreman training programs labeled "Training Within Industry," properly financed by federal war funds and backed by energetic leadership and promotion, contributed much to the war effort by improving foremanship and supervision throughout the nation. J.I.T. (Job Instructor Training), J.R.T. (Job Relations Training), and J.M.T. (Job Methods Training), with their training institutes and thousands upon thousands of classes carried new ideas to foremen many of whom were new and inexperienced in their work as supervisors. Through these activities the Allen 4-step plan of teaching with its *preparation, presentation, application, and test* steps became familiar to hundreds of thousands of foremen who could rightly be labeled "the forgotten teachers" of America. The vast majority of these supervisors had never heard of the *laws of learning* or the steps in a lesson; nevertheless, these men were charged with heavy instructional duties by the very nature of their positions. T.W.I. (Training Within Industry) spread the gospel of improved foremanship and proper teaching methods to those whom the more limited resources, staffs, and contacts of the regular vocational education agencies of the nation had failed to reach.

Housing and Facilities for Foreman Conference Work. Regardless of the type of foreman conference activity, the instructor in charge must always keep in mind the fact that the facilities and housing should meet the needs of adult groups because this form of conference work is truly adult education. Obviously a well-lighted room with chairs and tables is the preferred arrangement for all such classes. The placement of the tables should be such that all can see the blackboard. Incidentally, the blackboard should be more ample than is usually provided in most factory conference rooms because it is important that the board be large

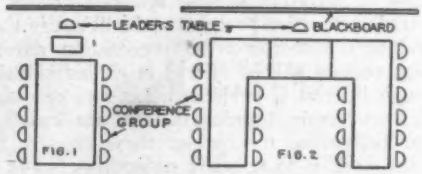


Fig. 1. Single table arrangement
Fig. 2. U-type arrangement

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[1]Charles R. Allen, *The Foreman and His Job* (Philadelphia, Pa.: J. B. Lippincott, 1922).

[2]Charles R. Allen, *The Instructor, the Man, and the Job* (Philadelpsia, Pa.: J. B. Lippincott, 1919).

[3]Frank Cushman, *Foremanship and Supervision* (New York, N. Y.: John Wiley & Sons, Inc., 1927–38).

enough so that most of the material developed — if not all of it — can be left undisturbed throughout the entire conference.

If the group is small, the single table arrangement shown in Figure 1 may be used.

If the group is large, a U-type arrangement may be set up, as in Figure 2.

Sometimes a V or, in the case of larger groups, an E arrangement of tables is used.

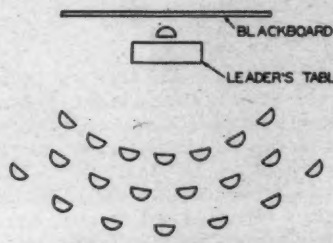

Fig. 3. Tablet arm-chair arrangement

If tables and chairs are not available, the next best alternative consists of tablet arm chairs arranged in semicircles in front of the leader's table and the blackboard, as in Figure 3.

The chief factors to keep in mind concerning choice of class arrangement are: the men should be comfortable; they should be able to see the blackboard from wherever they may be seated; the blackboard should be sufficiently ample; and the leader's table should provide adequate space to organize effectively the conference reports and other materials that are necessary. In connection with this matter of "comfort," many individuals experience a strong desire to smoke while in discussion groups of this type. Whether or not this smoking should be permitted will depend of course upon the housing facilities used. In schools and many factories it is taboo. The instructor will have to be governed by the situation in which he finds himself, but he should make the decision clear to the group, whatever it may be, and the reasons for it. In general, foreman conferences of all kinds run more smoothly and effectively when smoking is permitted.

Types of Foreman Training Activities

Nomenclature concerning the various types of foreman training activities in the different states is far from standardized; however, in general, foreman training as sponsored by the various federal, state, and local vocational education agencies falls into three main groupings: (1) general foreman improvement courses; (2) foreman instructor training; (3) conference leadership training. The first activity is usually locally sponsored on an evening trade extension basis while the other two activities are usually carried on by state boards for vocational education through their vocational teacher training staffs, either directly from the state departments of vocational education or through co-operating universities.

General Foreman Improvement Courses. The first activity, often labeled *foreman improvement* or *foremanship*, is generally effected through local vocational education agencies sponsoring series of meetings of foremen in their community. The local vocational director or co-ordinator will schedule classes as part of his evening trade extrension program and will notify the industries of his community concerning the registration dates. In some instances such courses will be offered in an individual factory or plant if enough interest is evidenced. Leaders previously trained in conference leadership training courses are usually employed by the local authorities to conduct these classes. The specific purpose of the work is to upgrade supervisory staffs in industry by helping them analyze and solve their many problems. That this activity is effective and successful is attested to, first, by the fact that it is extremely popular; and second, that dozens and dozens of *private* foreman training agencies throughout the nation are carrying on the work, selling their courses at a profit. Truly, imitation and commercialization constitute an excellent endorsement and compliment to the movement.

Foreman Instructor Training. This second activity, *foreman instructor training*, is usually carried on by representatives of the state boards for vocational education or by members of the vocational teacher training staffs of co-operating universities that work with and through local school boards and school authorities. The fundamental purpose of this activity is to improve the foremen as instructors. The laws of learning, the steps in the Allen method of teaching, various teaching devices, organizing instruction units, and similar subjects of value to anyone charged with instructional responsibilities are studied in detail. Sample instruction units are developed and are presented by members of the group for analysis and constructive criticism. The J.I.T. phase of T.W.I. (Training Within Industry) was a ten-hour condensation and adaption of the 32 clock-hour course usually titled *instructor foreman, foreman instructor problems*, or given some similar title when offered by the vocational educational agencies of the state staffs for vocational education or the vocational education departments of co-operating universities. Foreman instructor training undoubtedly contributes a great deal to the foreman's effectiveness as a teacher for teaching is definitely one of his major responsibilities though it is often unrecognized and sometimes sadly neglected.

Conference Leadership Training. The third type of foremanship service, *conference leadership training*, is generally carried on by expert conference leaders of the various vocational teacher training staffs of the state boards for vocational education and their co-operating university agencies. In reality this activity can be said to be the backbone of all effective foreman training work. It must supply the *reservoir of trained leaders* for the other activities and must be depended upon very largely to sell and motivate the entire program.

Because of its importance and because its techniques can be used in many other educational areas, the balance of this discussion will be devoted to a study of the objectives of conference leadership classes, the methods of establishing programs, and an analysis of the techniques used in successful conference leading with suggestions as to special applications in school situations.

Objectives of Conference Leadership Courses. The general objectives of conference leadership courses cover many areas and may be briefly summarized as follows:

1. To develop ability in leading conferences
   a) By study and by observing conference techniques
   b) By leading and by participating in conferences
2. To develop general qualities of leadership
3. To develop ability to express one's self in group discussions
4. To assist foremen in analyzing and solving various problems in foremanship
5. To develop analytical attitudes toward all problems
6. To develop the interest of foremen in self-improvement
7. To develop a better understanding of workers
8. To promote better human relations in industry
9. To improve the foreman's understanding of the laws of learning and his instructional responsibilities
10. To provide a reservoir of trained conference leaders who will be able to lead and participate in conferences effectively.

Even a cursory study of the above objectives discloses the importance of the conference leadership program. These objectives should be explained in detail to the conference leadership classes at the first meeting.

Setting Up Conference Leadership Programs

In setting up conference leadership classes, one should keep in mind the fact that the individuals trained should be a *selected group*. They become the leaders who later should go back to their respective plants, and occasionally go into other plants to lead conferences of their own. Thus objectives 1 and 2 in the preceding list are the all-important objectives of the work, and selection of proper talent is a most vital factor if the conference leading program is to function as it should.

In organizing conference leadership classes, two distinct patterns are followed: (1) a conference series for the foremen of a single plant may be established usually, but not always, on company time; and (2) a series of meetings may be organized for the

foremen of several industries of a city, the men meeting on their own time, generally in the evening at some convenient central point such as the high school, Y.M.C.A., or the Chamber of Commerce. In any case, the local school authorities should be one of the sponsoring agencies and should be so recognized. If the city has a vocational education program, the local director or co-ordinator should be called upon to help establish the series whether in a single plant or for an associated group because he is the one who is familiar with the needs of industry in his community. Often these courses are organized through the co-operative efforts of the local school authorities and other agencies such as the local foremen's club, Chamber of Commerce, or a service club.

Each series of conferences is usually of 32 clock hours' duration on the basis of 16 two-clock-hour sessions, or some similar arangement. Certificates of completion of the work of the course are granted and are usually based on a minimum attendance of 75 per cent, and successful participation in the work of the class.

Individual Plant or Company Groups. The most satisfactory method of starting a series of conferences in an individual plant is for top management to choose at least 15 of its "keymen" who will profit from the instruction and who later could be responsible for leading plant conferences of their own after the first series of conferences is completed. These selected men are then notified of the meetings which are usually scheduled on company time. In certain cases the group may meet at some outside place in the evening on the men's own time; however, experience has shown that the greatest benefits will be secured if the classes are held in the plant during the working day. Conditions are then such that the foremen approach questions and problems involved in conference leading with a far better mental attitude. Incidentally, during a series of conference leadership classes, the foremen gain much better understandings of each other's responsibilities and develop into a really co-operative organization working for the general welfare of the firm. In addition, attendance is much more consistent in this plan, and the importance of *all* members attending *all* sessions cannot be stressed too much. Only with consistent attendance and the full co-operation of all concerned can the greatest benefit be secured from these meetings in mastering conference leading techniques and in developing conferences to improve human relations among foremen and men and to solve plant problems effectively.

Another advantage of holding the conferences on company time is that it requires foremen to develop *understudies* or assistants. This experience in itself is very worth while to the foremen and it builds up a supply of talent that later may be used for foremanship material. However, it should always be kept in mind that the primary purpose of conference leadership courses is to train leaders who will later lead conferences of their own in their own plant or in some other organization as needed.

Associated Groups. Associated group conferences are usually started by a co-operative arrangement of a vocational teacher-training agency with the local boards of education through the school's department of vocational education. The different plants are notified of the opportunity to send representative keymen whom they wish to have trained in conference leading; a meeting place is usually arranged by the local superintendent of schools or by the director or co-ordinator of vocational education; and an organization meeting is held to launch the work.

Conference Techniques

The First Meeting. At the first meeting of any conference leadership group, the instructor of the series of meetings must gain the interest and confidence of his group and sell them the value of the course. This first meeting is a crucial one. In addition to outlining the objectives of the course, arousing interest, and selling the program, the instructor in charge should make a good beginning at putting over the fundamentals of conference leading and he should demonstrate just how the method works by putting on a sample conference. At the beginning of the first meeting, he should pass out a suggestive list of conference topics (see Check List No. 1) to be checked by the group to prove to them that he will not use a cut-and-dried "canned" course of training and to give them an opportunity to express their preferences, at the same time stimulating their thinking. The check lists should be taken home by the members of the group to be considered and to be checked to show preferences of conference topics. They should be returned at the succeeding meeting. Check List No. 1 shows such an unchecked list of conference topics.

CHECK LIST NO. 1
Suggestive List of Foreman Conference Topics

NOTE: Draw a circle around the numbers preceding the topics you would like to have taken up at future meetings. Write in any others that are not listed.

1. Absenteeism
2. Accident prevention and safety
3. Analysis of foreman responsibilities
4. Arousing interest in employees of little education
5. Aptitude tests as factors in the hiring and placing of employees
6. Attitudes and characteristics of workers
7. Attitudes of foreman toward workers in his charge
8. Attitude of top management toward employees
9. Carlessness on the job
10. Choosing workers
11. Combating shiftlessness on the job
12. Co-operation and teamwork
13. Cost control
14. Current supervisory problems
15. Developing a self-rating scale for foremen
16. Developing a workers handbook
17. Discipline and morale
18. Elimination of waste
19. Employee recreation work
20. Getting out production
21. Giving orders, directions, and suggestions
22. Good housekeeping
23. Handling discipline
24. Handling suggestions from workers
25. Handling women workers
26. Handling workers' complaints and grievances
27. Hazard analysis
28. Hourly rate versus piecework as methods of wage payment
29. Inducting new workers
30. Instruction and supervision techniques
31. Interest and interest factors
32. Job analysis
33. Keeping workers satisfied
34. Cutting down labor turnover
35. Leadership
36. Maintaining good working conditions
37. Making difficult jobs seem easy
38. Maintaining morale
39. Merit rating of workers
40. Methods and problems of procurement
41. Personal contacts between supervisors and workers
42. Plant harmony
43. Plant protection
44. Problems in human relations
45. Production planning
46. Proper placement of workers
47. Proper use of authority
48. Putting your ideas across
49. Qualifications of a good supervisor
50. Records and reports
51. Showing a personal interest in the worker
52. The foreman's job today and twenty years ago (comparisons and contrasts)
53. The place of the conference in industrial relations
54. The use of the Richard's formula in rating men
55. Time and motion study
56. Types of troublesome workers
57. Use of practical psychology in handling workers
58. Wage incentive plans
59. What does the foreman have a right to expect of top management
60. What does top management have a right to expect of foremen
61. Why do people work

Others: (Write in)

.....

.....

.....

.....

.....

CHECK LIST NO. 2
Selected List of Foreman Conference Topics

1. Co-operation and teamwork (11)
2. Combating shiftlessness on the job (10)
3. Analysis of foreman responsibilities (9)
4. Handling discipline (9)
5. Absenteeism (8)
6. Accident prevention and safety (8)
7. Aptitude tests as factors in the hiring and placing of employees (8)
8. Giving orders, directions and suggestions (8)
9. The use of the Richard's formula in rating men (8)
10. Attitude of top management toward employees (7)
11. Carelessness on the job (7)
12. Developing a self-rating scale for foremen (7)
13. Getting out production (7)
14. Personal contacts between supervisors and workers (7)
15. Attitudes of foreman toward workers in his charge (6)
16. Current supervisory problems (6)
17. Discipline and morale (6)
18. Elimination of waste (6)
19. Maintaining morale (6)
20. Putting your ideas across (6)
21. Cost control (5)
22. Hazard analysis (5)
23. Interest and interest factors (5)
24. Cutting down labor turnover (5)
25. Qualifications of a good supervisor (5)
26. Records and reports (5)
27. Use of practical psychology in handling workers (5)
28. Employee recreation work (4)
29. Good housekeeping (4)
30. Job analysis (4)
31. Keeping workers satisfied (4)
32. Leadership (4)
33. Maintaining good working conditions (4)
34. Making difficult jobs seem easy (4)
35. Plant harmony (4)
36. Problems in human relations
37. The foreman's job today and twenty years ago (comparisons and contrasts) (4)
38. Arousing interest in employees of little education (3)
39. Attitudes and characteristics of workers (3)
40. Choosing workers (3)
41. Handling suggestions from workers (3)
42. Handling workers' complaints and grievances (3)
43. Hourly rate versus piecework as methods of wage payment (3)
44. Proper use of authority (3)
45. What does top management have a right to expect of foremen (3)
46. Developing a workers handbook (2)
47. Handling women workers (2)
48. Instruction and supervision techniques (2)
49. Merit rating of workers (2)
50. Methods and problems of procurement (2)
51. Plant protection (2)
52. Proper placement of workers (2)
53. Types of troublesome workers (2)
54. What does the foreman have a right to expect of top management (2)
55. Inducting new workers (1)
56. Time and motion study (1)
57. Handling problems of instructions when having men on 3 shifts (1)
58. Compulsory military training (1)
59. Relations with other foremen (1)

After the checked lists are collected at the next meeting of the group, the choices are tabulated and the "Selected List of Topics" (see Check List No. 2) is established. Check list No. 2 is quite typical of the distribution of elections secured from any group; the numbers in parentheses indicate the number of times that that particular topic had been chosen.

It should be noted that in the original *Suggestive List No. 1* the topics are arranged alphabetically while in the rearranged *Selected List No. 2* they are placed in order of importance as determined by the group selections. Topics for the conference series are to be chosen from the selected list.

Value and Use of Group Background. Conference leading is really a skillful pooling of the knowledge of the group and focusing it upon the problem at hand, much as a lens focuses rays of light. The diagram, Figure 4, should be used to arouse the interest of the foreman and prove the effectiveness of the procedure.

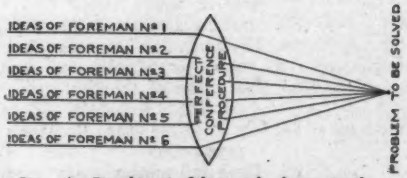
IDEAS OF FOREMAN Nº 1
IDEAS OF FOREMAN Nº 2
IDEAS OF FOREMAN Nº 3
IDEAS OF FOREMAN Nº 4
IDEAS OF FOREMAN Nº 5
IDEAS OF FOREMAN Nº 6
PERFECT CONFERENCE PROCEDURE
PROBLEM TO BE SOLVED

Fig. 4. Pooling of knowledge similar to a lense condensing the rays of light

Another very effective means of illustrating the pooling procedure is to illustrate the knowledge of the group as being represented by the shaded portions of many circles, as shown in Figure 5. When the circles are superimposed (by effective conference leading), as is shown in Figure 5, the group will readily agree that "everybody now knows what everybody else knows."

As a clincher to drive home the value of the pooling idea, the instructor should pass out slips soon after opening the first meeting asking for the following information:

1. Years of experience as a worker .....
2. Years of experience as a supervisor .....
3. Total years of experience in industry .....

When these slips are collected and the items are compiled in two columns headed *Worker* and *Supervisor* (the total figures were called for only to prevent confusion), the group will discover that

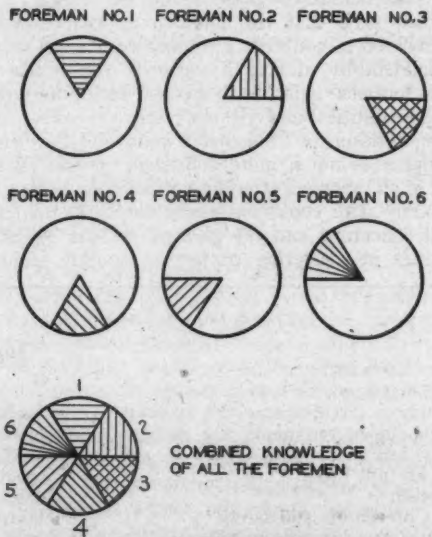

Fig. 5. Pooling individual knowledge into group knowledge

hundreds of years of industrial and supervisory experience are represented in even a small group. This will give them confidence in the conference method even before a conference has been led.

School Application of Experience. At this point one might properly detour from the main theme of our discussion and ask, "How can the conference method be used in school when the students have had no real backgrounds of industrial experience?" At first glance this argument against the use of the conference method in school situations seems plausible, but if it is kept in mind that the conference method for schoolwork is a tool to meet only certain situations, the answer is apparent; the students *do* have backgrounds, and really considerable backgrounds in problems concerning school order, school conduct, and school routines. A group of 25 students in the tenth grade will thus have had approximately 250 years of experience in school procedures, good and bad; they know all the devices that aggravate teachers, they know how far they can go with different instructors and still escape the hated *detentions;* they also know all the answers on how to correct rowdyism, classroom and shop disorder, theft,

and insubordination, and if they can be prevailed upon to analyze the various situations and determine the remedies in a conference, the cure is certain when a course of action has been decided upon because the decision is the students' and not the teacher's.

The conference method is also an extremely valuable device to enable a group to think through new problems by assembling previous data and applying them to the new situations. Yes, for many, many school situations the conference method tool cannot be beaten, it has no equal.

Comparison of Conference Leading With Teaching. Let us return to our foreman conference group and make a brief analysis of the conference procedure itself for the benefit of the members of our opening conference session. Perhaps the easiest and surest attack available to the instructor is to compare the conference procedure with the Allen 4-step teaching plan. Most of the group already understand the Allen 4-step procedure from their J.I.T. experience, although they may not recognize it by that name. The relationship existing between *instructing* and *conference work* was demonstrated by the following chart depicting the steps of the standard Allen 4-step plan of teaching and the conference plan.

ANALYSIS OF FACTORS HINDERING CO-OPERATION BETWEEN FOREMEN

1. Factors Hindering Co-operation	2. Who or What is to Blame	3. What Should Be Done?

Obviously this chart heading requires that the conference leader go through parts of 4 steps in order to be successful. He must collect and classify data for columns 1 and 2; he must also *select* to some extent, thus using all of step 2 and part of step 3. To fill out column 3, he must help the group *reach decisions* and *make plans* which are steps 4 and 5 of the conference. The evaluation part of step 3 is often effected by rating the importance of the various items by starring, lettering (A, B, C, D), or otherwise indicating their importance. Step 3 of the conference plan has really no duplicate in the Allen plan. This leaves step 4 of the Allen plan to be compared with step 6 of the conference procedure. Obviously no relationship exists; the summary of the conference

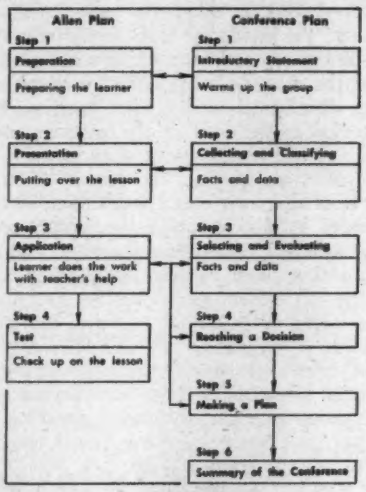

Fig. 6. Comparing the Allen plan with the conference plan

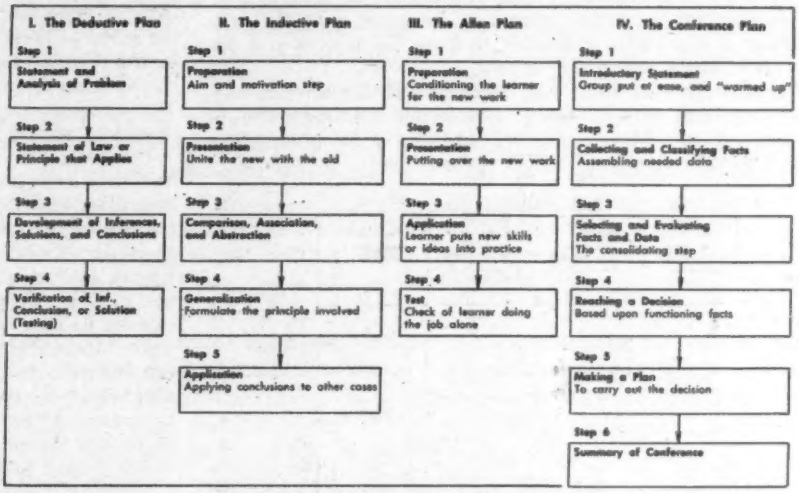

Fig. 7. Four types of teaching plans

First of all, the four steps of the Allen plan are: (1) preparation, (2) presentation, (3) application, (4) test.

These steps must now be compared to the six steps of the conference procedure which are: (1) introductory statement, (2) collecting and classifying data, (3) selecting and evaluating data, (4) reaching a decision, (5) making a plan, (6) summary. The comparison is best made graphically as in Figure 6.

In studying Figure 6, one perceives immediately that step 1 in both plans is for practically the same purpose — to introduce the topic and to prepare and motivate the group to receive (or to participate in) what follows. It is a most important step whether in a teaching situation or in a conference.

Steps 2 of both plans are similar in purpose although different in method; in step 2 of the Allen plan the teacher *presents* the lesson content; in step 2 of the conference plan the material is *collected* from the various members and is presented to the entire group by listing it on the blackboard. From the ends of step 2, the procedures in the two plans are quite different; however, step 3 of the Allen plan is roughly matched, in purpose at least, by steps 3, 4, and 5 of the conference plan. It should be kept in mind, though, that the procedures involved are quite different. It should also be noted that steps 3, 4, and 5, and sometimes 2, 3, 4, and 5, in the conference plan often are *telescoped* together as, for example, when chart headings are used that concern collecting, classifying, or selecting data and also reaching a decision and planning. This analysis type of chart heading, outline of which follows, often makes it possible to effect several steps of a conference simultaneously.

recapitulates the materials developed and stresses the important points while step 4 in the Allen plan checks the effectiveness of the teaching. The *test* of the conference comes much later and is based on such factors as: how well did the plans that were developed really work; were human relations really improved; were problems really solved; were attitudes really changed? Thus in teaching, summaries may be considered as devices to clinch learning (parts of steps 2 and 3 of the Allen plan), while in the conference the summary is a complete step in itself and a separate unit.

For the benefit of teachers who may not be familiar with the Allen plan of teaching, the writer is including a comparison chart that discloses the elements of two other procedures — the *deductive* and the *inductive plans* — as well as the Allen plan and the conference plan. See Figure 7. While this chart has been found to be quite valuable for use with teacher groups, it is of little or no value for use with foremen who are usually familiar with only the Allen plan. In their case, Figure 6 is very effective and, in the opinion of the writer, it is the only illustration that should be used.

Factors Determining the Selection of the Proper Teaching Procedure

Since the Allen plan and the conference plan are so different in organization and purpose, it is important that the correct tool be selected for a given situation.

A graphic comparison of the factors involved in selecting the conference method or the Allen lesson procedure is illustrated by the chart, shown in Figure 8, which depicts relationships between

new teaching material and *old material* in four different teaching situations and indicates the procedure that should be used in each case.

Since a conference is the process of pooling the knowledge of any group and focusing it on a given problem, it is quite evident that holding a conference on a topic with which a group was totally unfamiliar would fail, since *ignorance* would be pooled instead of *knowledge*.

The Rules of Conference Work

The rules of conference leading as outlined in the following should be explained thoroughly to the conference group immediately following the comparison of conference leading with the Allen plan of teaching and the analysis of the factors determining the choice of procedure.

The Rules of Conference Work

1. The leader must be a *leader* — *not* a teacher. If possible, do all necessary teaching connected with the unit in the introductory statement.
2. Everyone can contribute and is *expected* to contribute.
3. Personalities are "out" — they have no place in a conference. Save your "brickbats" for use in some other place.
4. If anything humorous comes up, we laugh *with* the man who brings it up. Please remember that we laugh *with* and not *at* him. A little fun won't hurt anyone.
5. Feel free to contribute your ideas even if they are not fully worked out in your own mind. The leader will help you to straighten out your ideas and so will the rest of the group. It is *ideas* we want, not perfect English composition.

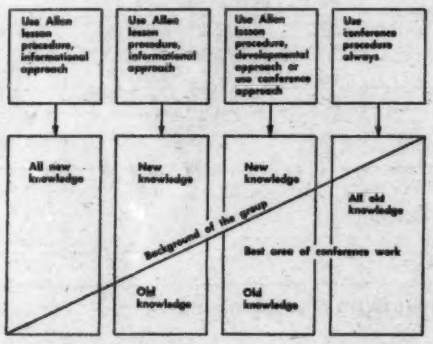
Use Allen lesson procedure, informational approach
Use Allen lesson procedure, informational approach
Use Allen lesson procedure, developmental approach or use conference approach
Use conference procedure always
All new knowledge
New knowledge
New knowledge
All old knowledge
Background of the group
Best area of conference work
Old knowledge
Old knowledge

Fig. 8. Analysis of four teaching situations

6. Maintain informality of procedure at all times.
7. Secure attention and confidence of the group at the start.
8. Secure settlement of arguments
   a) By majority vote (dangerous if the minority is large and unconvinced)
   b) By deferred decision for added information
   c) By counter proposals to secure agreement or break line of thought
9. Drop uninteresting conference topics if interest cannot be aroused, and substitute a topic that is interesting.
10. Maintain flexibility in conference procedures at all times.
11. Don't short-circuit the thinking of the group; help the group think the problem through.
12. As a rule, don't answer questions; leaders should "reverse" or throw back questions to the group.
13. *Use the blackboard constantly*
   a) For recording all major contributions (be alert to record all valuable offerings)
   b) For compiling materials for evaluation
   c) For working out charts
14. Have notes taken by some individual so that other members of the group may be free from note taking.
15. Provide reports of all meetings to all members of the group.
16. Provide adequate facilities for meetings
   a) Table and chairs
   b) Blackboard
   c) Light and ventilation

Completing the First Conference. After the preliminary work just described has been put over at the beginning of the first meeting, the session should be brought to a conclusion with a snappily conducted conference that will disclose the effectiveness of the procedure. Several topics are particularly good for this first session, such as "Co-operation Between Foremen and Top Management," "Co-operation Between Foremen and Men," "Co-operation Between Foremen." "Analysis of Types of Workers" is a topic that always secures attention and interest.

During this first meeting, it is important that the instructor use care in maintaining his true role as leader: he should be enthusiastic, he should commend contributions freely, and should be alert to place practically all contributions on the blackboard.

If the first conference has *clicked* the way it should, and the interest of the group has been aroused by a feeling of having participated in something worth while, the instructor is off to a good start and, unless he runs into unforeseen difficulties, he should have a successful series of meetings.

Conference Reports and Reviews. Conference reports are extremely important. Notes should be taken by some member of the group at every meeting; the instructor then should edit them, include his comments if he has any, add the rating scale summary if one is used, and have the notes mimeographed or duplicated. These reports should be distributed at the next meeting which should be opened by a review of the work of the previous session.

Following the review, the instructor may then present new material concerning conference leading techniques such as: describing conference devices and their best applications; developing conference rating scales for use in rating the sample conferences; reviewing the relationships between teaching and conference leading and explaining them in more detail than at the first meeting; detailing the conference operation sheet and demonstrating its use; and presenting other similar technical material of value to conference leaders. This portion of each session should not consume more than fifteen or twenty minutes since ample time should be reserved for a sample conference to be conducted by some member of the group at each meeting. In no other field of work is the saying that "one learns by doing" more true. One learns to lead conferences only by leading them.

Choosing Conference Topics. At the third or fourth session, members should be invited to volunteer to lead sample conferences, choosing conference topics from the check lists previously described. The topics and names of the leaders should be scheduled on each report under the caption "future conferences" until that conference has been presented. Often some difficulty is encountered in securing volunteer conference leaders; of course theoretically this reluctance should not occur and usually it can be overcome by the instructor's promise to help the volunteers work out their conference operation sheets which should be done for each leader in turn. Often reviewing with the prospective leader a report of successful conferences on the subject that have been led previously will give the volunteer a sense of confidence so necessary in this work and thus he will completely overcome his reluctance to lead a sample conference.

Conference Devices. Conference devices are the implements or tools by means of which the conference leader is enabled to carry his conference to a successful conclusion. In the main, these devices consist of questions of various types, chart headings, analyses, case studies, and similar devices. A rather elaborate list is submitted herewith for study.

(*To be continued*)

Before the eighteenth century, the golden age of mahogany, a cabinetmaker was not a cabinetmaker at all but either a carpenter, a joiner, or a turner, and sometimes several at once, since it was the custom for the man who built your house also to build your furniture. Out of this latter circumstance developed some of the earliest labor troubles on record, during which the rights and duties of each group were definitely, though only temporarily, defined.

Industrial Arts and Vocational Education

John J. Metz, Editor

JUVENILE DELINQUENTS

The delinquent is commonly pictured as coming from the slums, from blighted areas, from poverty stricken homes, or from broken homes. No doubt, children who grow up under such surroundings are quite likely to go wrong because conditions are definitely against them.

However, the sons and daughters of well-to-do families also are found among the delinquents who are brought into the juvenile courts, and frequently the acts of vandalism perpetrated by these children of the wealthy show a spirit of viciousness and a disregard for the rights and property of others that is almost beyond comprehension.

These delinquents, it should be remembered, are members of families, and one would expect that their parents would be the ones who would assume the responsibility for the action of their children. More and more, however, parents have turned this duty over to the school. Of course, one would hardly suspect that parents felt that they had turned any rights over to the school when, on occasion, one of their offspring is punished or chided for some misdeed in school. Parents think it quite proper on such occasions to storm into the school and angrily berate and even threaten both the principal and the teacher. Nevertheless, when a wave of vandalism strikes a community, the newspapers and the public at large usually voice the opinion that the school is partly to blame for the existing conditions because it is not fulfilling its full obligation. Probably there is some truth to these assertions. If there is, it is something that the individual teacher has little to say about, because it is not within his power to set up policies, or to inaugurate new activities. Individual teachers, however, do frequently spend part of their own time on extracurricular activities because they feel that it is their obligation to supervise the activities of some of their students during out-of-school time. This, of course, is altruistic service which receives little recognition, although the individual teacher who is assuming the extra burden may not be expecting any thanks for what he is doing. He, however, is setting a good example for school administrators and for his fellow teachers. As conditions in so many families are, it seems increasingly necessary for the school to assume the care of all of the children in a community for a greater portion of the day. This may not be the only way, but is effective in reducing delinquency.

THE A.V.A. CONVENTION AT ST. LOUIS

The year 1946 will go down in history as the "Year of the two American Vocational Association Conventions." The meeting that was held in February discussed on a country-wide basis the problems that confronted the school shop relative to the returned veteran, to the further training of those who were hurriedly prepared for the war industries, and to the youth who is legally obliged to attend school to an age which varies somewhat in different states.

The coming convention, which will be held on December 4, 5, 6, and 7 at St. Louis, Mo., brings its members back to the old time convention routine, which placed the annual meeting in the early part of the last month of the year. In spite of the fact that only nine months have elapsed since the last convention there are very important questions that should be studied and discussed.

First and foremost is the new George-Barden vocational education bill, which was recently passed by both Houses of Congress and signed by President Truman on August 1, 1946. This act opens up new possibilities for vocational education, and the proper use of the additional monies which it provides should be, and will be, most carefully considered.

Then, there are other up-to-the-minute problems that will be taken up. Just to mention a few of them will suffice to show what those who do not attend will miss. For instance, some of the subjects that will be discussed are: defining the scope of trade competency examinations; how can vocational education be made to serve the sixty per cent referred to in the Prosser resolution?; impact of apprenticeship on the trade and industrial program; the current picture in the training of veterans; improving the industrial arts, and training effective industrial-arts teachers; development of related course materials for apprentice training; and many others.

As in previous years, the industrial-arts programs will be inspirational and enlightening, and the meetings will be well attended. As a matter of fact, it is quite commonly conceded that the attendance at the December convention will surpass any of those held to date.

THE SCHOOL SHOULD SHOW THE WAY

The week of October 6 to 12 was designated "National Employ the Physically Handicapped Week." There was a time when the handicapped were looked upon merely as fit subjects for charity. This, fortunately for those handicapped, is no longer the dictum of those who have the good fortune not to have suffered any crippling accident, or some disabling affliction like that produced by the dread polio, or other epidemics.

To provide the physically handicapped with training and employment is looked upon by everyone as most laudable. Industry has been asked by President Harry S. Truman to do its share in employing those who have been rehabilitated, and it is surprising how many of the unfortunate victims of World War II have already found a new lease on life because they have proved to themselves and others that they can successfully cope with life and provide themselves with a living as well as though they were not handicapped.

Vocational education has already done, and is now doing, a fine job of rehabilitation training. In some cases it has achieved almost miraculous results. But a real opportunity has been overlooked if the school does not take advantage of the training and experience some of the disabled veterans have gained before, during, and after the conflict that has returned them to us as men who are physically handicapped.

Many of these men possess excellent educational and vocational backgrounds. Why not train them as teachers? Their very disability makes them attractive to students, for they look upon these men injured in war as heroes who have given more than ordinary service to their country. Teaching offers, not only an opportunity to these returned soldiers, but it also gives them a chance to offer a fine example of willingness to overcome handicaps, and to triumph over them.

Let's rehabilitate handicapped ex-servicemen, train them as teachers of related and shop subjects, and in that way relieve the manpower shortage in the field of education.

The Use of Training Aids

Homer C. Rose and Michael B. Callahan***

Much has been written on the part which training aids have played in training our armed forces and the impetus that their widespread use will have on public schools and other civilian training. Much has been written, too, on the benefits to be gained through the use of this "new weapon."

It is the purpose of this article to give the reader a basis on which to build a working knowledge of the nature, scope, and limitations of this adjunct to teaching; and further, to point out some of the traps and abuses into which the inexperienced instructor is apt to fall.

What Are Training Aids?

Training aids have been variously defined. For purposes of this discussion we shall consider them to be any device or piece of equipment, *pertinent to the subject of the lesson,* that is used to help the student to understand and learn. It can be readily seen that this definition excludes only such things as the written or spoken word, the classroom furniture, and ventilating system.

Training aids may be divided roughly into four types:

a) *Synthetic Training Devices.* A device or object which is built to simulate the action or function of the real device and *which is operated by the student.* The prime purpose of this type of aid is to develop *feels.* The *Link* Trainer is an example of this type of training aid.

b) *Visual Training Aids.* Those aids which make their appeal through the sense of sight. The blackboard, posters, and silent films and film strips fall in this classification.

c) *Audio-Visual Training Aids.* Those aids which make use of both sight and hearing. The best example of this type of aid is the sound motion picture.

d) *Auditory Training Aids.* These are such devices as wax or wire recordings which help the student to learn through hearing only. The army and navy have found these useful in accustoming men to sounds of battle.

On the basis of construction it is sometimes convenient to classify training aids thus:

a) *Graphic Training Aids.* This group includes all flat pictures, posters, graphs, charts, diagrams, blackboard, etc.

b) *Projected Training Aids.* Here one would find motion pictures, slides (strip) film, transparent slides (2 x 2 and 3¼ x 4), and material for opaque projection.

c) *Mechanical* (three-dimensional) *Training Aids.* Models (enlarged, miniature, working), actual objects, cutaways, mock-ups, etc., would be included here.

What Is a Good Training Aid?

The value of training aids lies in the fuller and more rapid understanding that accompanies their use. They are effective

Fig. 1. This poster illustrates a number of the characteristics of the better training aids. It is simple; unnecessary details are eliminated. It has unity; each element contributes to the one thought. It is colorful; in the original the color scheme enhances the sordidness of the situation. Fig. 2, right. Illustrated here are undesirable characteristics such as jumbled arrangement, lack of coherence, and wrong emphasis through misplaced color masses which also detract from the visibility

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because of: (1) their appeal to more than one sense, (2) their ability to attract and hold attention, (3) their ability to focus the attention of all students on one item at the proper time, (4) the fact that a reproduction of a device or process is vastly superior to a simple word description for instructional purposes.

Every progressive instructor will design, or at least select training aids to be used in his classes. In order that the greatest usefulness may be obtained, the instructor should carefully judge the aid against the following criteria.

Fig. 3. The use of form here guides the eye from one phase of an idea to the next[1]

[1] This poster can be depended upon to start a discussion because at first thought stalagmites *do* grow up from the floor of the cave; the materials of which they grow, however, trickle down from the top.

Assuming that the workmanship is of good quality; that is, the work clean, clear, etc.; the value of the aid will be in direct proportion to its:

a) ***Simplicity and Unity.*** There should be a singleness of ideas unadorned with irrelevant and distracting material. See Figure 1. Too many graphic aids look like patent medicine labels. The trainee cannot assimilate many facts if presented en masse. Two or more ideas presented simultaneously split the attention of the group and the individual. See Figure 2. Short motion pictures on each phase of a subject are superior to long pictures which often include too much for effective learning.

b) ***Colorfulness.*** This quality may be achieved through an attractive design, the use of color, movement or form, humor and analogy. Great care must be exercised with respect to emphasis of the right idea. Use of bright color, for instance, on an unimportant detail will attract the attention of the student away from the more significant idea.

Form will, if properly used, guide the student from one phase of an idea to the next, from one relationship to another. See Figure 3.

c) ***Flexibility.*** No instructor worthy of the title ever taught the same lesson twice in exactly the same way. No two groups of students have exactly the same temperament, needs, or desires.

Trade practices, tools, and materials are constantly changing. In light of these facts, it behooves the instructor to select or construct his training aids in such a way that they may be modified if need be. The cost should be such that it is a negligible factor when it comes to deciding whether or not to discard the aid if the major portion of the aid becomes obsolete.

In this regard materials for opaque projection will be found most flexible and sound motion pictures least so.

Motion pictures are comparatively expensive, the order of presentation fixed, and it is practically impossible to insert new material. This drawback should be carefully weighed against the tremendous appeal they have through movement.

d) ***Timeliness.*** Any aid that is used *out of step* with the presentation of the material loses the major portion of its effectiveness. Movies shown *when the film or auditorium is available* are almost useless in terms of the training objectives.

e) ***Visibility.*** Any training aid should be of such size that the *smallest significant detail* is *large* enough for the *most distant student to see.*

There are other considerations here too. The instructor, heads of students in front seats, classroom equipment, glare on glossy surfaces, etc., may render an aid useless if they obstruct the view. Strangely enough the most common fault that the authors have found in the use of training aids is that aids are hidden wholly or in part by one of the things just listed.

f) ***Availability.*** Let us assume that the instructor has some funds and some facilities for making and storing training aids. He will find that some aids are still more available *at the time and place of need* than others. For example: The blackboard is, in most cases, available at all times although portable boards may be required when instruction is to be moved to stationary equipment. Material from books, magazines, instruction pamphlets, and trade journals are easily available at low cost for use with the opaque projector. The room, however, must be darkened and other arrangements made to facilitate showing and seeing the material. This material may be stored in any file drawer.

Posters, charts, and models require careful storage and reasonable handling; however, the sources from which they may be procured are varied; and if properly constructed and stored they will be readily accessible to the instructor when needed and without elaborate preparation.

Strip film and motion picture film are the least available of all the aids as they usually must be ordered well in advance, accepted when scheduled by the distributor, and returned soon after using.

In addition to the drawbacks inherent in the use of the opaque projector (darkroom, screen, etc.), all types of film and film projection equipment require very careful handling.

When Does One Use a Training Aid?

For obvious reasons the real object under discussion is best for instructional purposes whenever it is practical to use it. However, there are several instances when a training aid should be used instead.

For instance, if the real object is at either extreme in size (*too small* to be seen or *too large* to be comprehended), training aids are advantageous.

Sometimes an object or process is *not available* to the students through other means than training aids. Newly developed items or those too distant to be visited may be brought to the class through training aids.

FIG. 4

MOTION PICTURES
WHERE MOTION IS NECESSARY..

BLACK BOARD
VERY FLEXIBLE.
USED TO DEVELOP IDEAS

FIG. 8

FILM STRIPS
TO ILLUSTRATE A LECTURE WITH STILL PICTURES

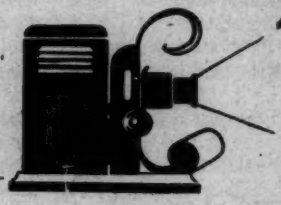
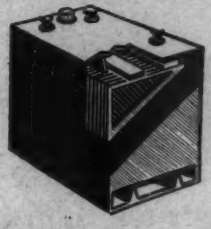


FIG. 5



CUTAWAY
WHERE INTERNAL PARTS MUST BE SHOWN

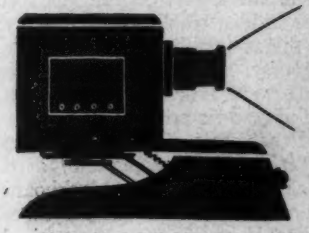
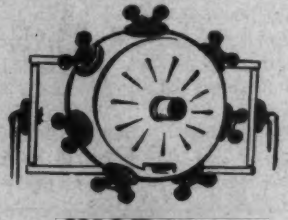


FIG. 6

OPAQUE PROJECTOR
WHERE IT IS DESIRABLE TO PROJECT PICTURES FROM BOOKS AND MAGAZINES
TO ENLARGE AND PROJECT SMALL RATHER FLAT OBJECTS

ACTUAL EQUIPMENT
MOUNTED OR DISPLAYED



POSTERS
WHERE NO PROJECTION EQUIPMENT IS USED...

FIG. 7

FIG. 9

WORKING MODELS
WHERE RELATIONSHIP OF MOVING PARTS MUST BE SHOWN
MAY BE LARGE OR SMALL SCALE

When the object or process is too *expensive, dangerous,* or *delicate* for trainees to use, aids must be employed.

In the case of plant growth, astronomical movement, and other *very slow* phenomena where change is not visible, moving pictures employing time-lapse photography or animation will be found useful.

At the opposite extreme where *rapidity of movement* prohibits perception of detail, slow motion photography comes to the aid of the harried instructor.

Some phenomena such as the flow of electricity, chemical processes, and action of gases are *naturally invisible,* therefore a representation must be used.

Electrical circuits are commonly *detailed* to the point of baffling the student. This is probably due to the distracting influence of many symbols and lines. The wise instructor will not try to use the real circuit or even a diagram of the complete circuit, but will construct overlay charts or diagrams which will simplify the layout in the student's mind.

The use of transparent materials to cover gear boxes to show movement of *internal parts* falls in a class with cutaway models. The use of both is excellent practice, limited only by the imagination and ability of the instructor.

Summarizing, the instructor who is alert to the needs of his class will endeavor to find those places in his instruction which need illustration. He will examine *all material* to be presented in light of the discussion above on instances when a training aid should be used.

If an aid is found necessary, he will then develop or select one which meets the criteria set down for a good training aid.

Simply using training aids (and especially motion pictures) does not solve all training problems. However, the intelligent analysis, selection, and proper use of training aids of all types is an important part of any successful teacher's job.

Training Aids and Tools — like other tools, we must learn to select and use them skillfully if we are to get results.

Motion Pictures. Motion pictures in the form of 16mm. training films are available on technical subjects. Many of these films are designed to help teach facts and steps of procedure in doing specific operations. While these films are not designed for entertainment, they are often of great interest and provide an excellent variation to the teaching process. Great care should be taken in the selection of training films as they must fit in perfectly with the lesson and course if they are to be effective. See Figure 4.

Suggested procedure for using motion pictures:

1. *Preview the film* by showing it and making notes on its contents with the following questions in mind: Does the picture's content meet the objective of the lesson in whole or in part? Which points in the picture need clarification? Students will learn up to 100 per cent more if the instructor leads a good discussion on the main points in the film after its showing. In order to do this most effectively the instructor must prepare his discussion questions in advance.

2. List the title of the film and the points to look for on the blackboard for students to read.

3. Prepare the room for showing the film by placing the projector and seats so that all can see without eyestrain. In hot

weather it may be advisable to sacrifice a little darkness for better ventilation. Move the projector closer to the screen if a brighter picture is desired. Width of screen should be not less than 1/10 of the distance to furthest student nor greater than 1/6.

4. Introduce the film. Tell the group what the film is to show and what they are to look for. Since the film has been designed for general use it is necessary that you emphasize what you want your group to be most interested in. Inform trainees how they will be tested on what they are to learn.

5. Show the film. The instructor should always remain with the class. If he has seen the film a number of times he can make further notes to help him lead the discussion that is to follow. The men will show more interest in the film if the instructor stays in the room and shows a personal interest in the showing.

6. Discuss the material shown in the film. Main or key points of the film should be discussed. This may be done by asking leading questions. Specific and important steps of procedure should be listed on the blackboard and gone over a number of times.

7. Reshow the film. This may be done at once or the second showing may be made several days later depending on the complexity of process shown and on how soon the trainees have an opportunity to use what they have learned. Most training films have more in them than the trainee can grasp in one showing. The discussion following the first showing should stimulate interest in the specific points to look for during the second showing.

8. Test. Check up on what trainees have learned by oral questions, written test, or performance tests. Motion pictures can be very valuable in the training program especially where motion such as found in any operation or process is to be shown. When properly used they can increase the amount learned in a given time by as much as 30 per cent or more as compared with teaching by the lecture method.

Film Strips: Film strips are much like a roll of film from your 35mm. still camera, in other words, a film strip is merely a strip of film with many pictures on it and a few printed instructions. These strips are cheaper to use than motion pictures and are very effective for those things that do not require motion on the screen. Some film strips are used with a record so that standard instructions can be heard by the trainee as he sees the pictures. This type is less adaptable to all situations than the silent strip; however, it is very usable where the instruction can be made very specific and where little class discussion is required. See Figure 5. *Suggested procedure for using silent film strips:*

1. Preview the strip and determine what comments to make while showing it.

2. List the title of the strip and the points to look for on the board for the class to read.

Fig. 10. Pictorial aids

3. Prepare the room and the equipment. Place the projector to obtain the proper size picture on the screen. Arrange seats so that all can see without eyestrain.

4. Introduce the film by telling group what it will show and what you expect them to get from the showing. Tell trainees how they will be tested.

5. Show the film. Allow time for all to read the printed explanations on each picture, then make comments and answer questions. Very little will be learned from

a film strip if it is rushed through the projector without good comments from the instructor. The instructor may stand by the screen and use a pointer to help direct attention to specific details. Any trainee can operate the projector for the instructor.

6. Reshow the strip. This is done to emphasize main points and to clear up misconceptions. As with motion pictures the reshowing may follow at once or may be delayed for sometime in order to work it in with other class activity.

7. Test. Measure what the trainee has learned by oral questions, written or performance tests.

The sound film strip may be shown in the same way except that the instructor cannot make comments during the showing. Some sound strips may run profitably the second time without sound. This gives the instructor an opportunity to make comments and to emphasize the key points in terms of the objective of his lesson.

The Opaque Projector: This machine is capable of taking any picture or illustration and projecting it, in color, on to a screen. See Figure 6. For example, an instructor may clip pictures from a magazine which illustrate a point or process in a lesson; mount these on a cardboard and project them on a screen. Very little difficulty is experienced in obtaining pictures to illustrate many processes and the instructor can quickly collect those that meet his needs. The room must be quite dark when using the opaque projector as the projected image on the screen is not as brilliant as that from films.

Suggested procedure for using the opaque projector:

1. Arrange the illustrations in the proper order for showing in the lesson.

2. Plan the remark that should be made while each picture is projected.

3. Set up equipment and arrange seating as for other projection equipment. Pictures must be kept bright by using the projector near the screen.

4. Use the projected illustrations during the class in the same manner as when using posters or blackboard. The instructor should always use a pointer and stand to one side of the screen. If the pictures are arranged in order and numbered, a trainee may assist the instructor by operating the machine. This is a good job for the trainee who needs extra responsibility.

Wall Charts and Other Pictorial Aids: Graphic training aids in the form of large pictures, diagrams, posters, and charts are widely used and a most practical form of training aid. Their chief advantage lies in their adaptability to almost any classroom teaching situation. Many can be drawn or constructed by the instructor to fit his own exact needs. See Figure 7.

Suggested procedure for using posters and charts:

1. Select and prepare those aids that will help to emphasize or illustrate points in the lesson. Many ideas can be illustrated by sketches drawn on wrapping paper with colored chalk or crayon.

2. Mount the posters where they will be usable to the class but cover them so that they cannot be seen until needed. If charts are left exposed they distract the trainees' attention from other steps in the lesson:

3. Plan how and when the aids will be used in the lesson.

4. Use the aids. During the lesson the instructor should display the aid at the right time and use a pointer to indicate location of parts or movement of current, gases, etc. Always stand to one side of the chart and face and talk to the class.

5. Call upon a trainee to take your position and go through the explanation as you have done. This will help to clear up misconceptions and will hold trainees to account for the information.

Characteristics of a good pictorial aid:

1. All unnecessary details omitted.

2. Lettering simple and easy to read from any seat in the room.

3. Color used to identify related parts and to force attention on main ideas.

4. Technical details and symbols should be technically correct although details may be omitted.

5. Mounted in some way so as to provide support yet not limit its use. 20 by 24-in. illustration board is excellent for a series of illustrations. An easel should be used to support the charts. Some instructors have used light colored window shades on which the illustrations have been drawn. A series of sketches on wrapping paper may be mounted on a horizontal bar which acts as a binding and each chart may be thrown over to expose the next. Some pictorial aids may be placed on the bulletin board or wall for further examination by the men during free time. They must be changed very frequently. As a general rule no pictorial aid should be left up longer than one week.

The Blackboard: The blackboard is the most flexible training aid as its use is limited only by the imagination and drawing ability of the instructor. See Figure 8. Many of the steps of procedure for using charts and pictorial aids will also apply to the blackboard; however, a few specific points may be added:

1. Plan all blackboard illustration before class with thought given to the use of color to make parts stand out.

2. Complicated drawings should be drawn on the board before class.

If the drawing is quite detailed and complicated, yet for instructional purposes it is desirable to develop the drawing while the class is observing, one of several techniques may be used. The drawing may be placed on the blackboard with an ordinary lead pencil. This line will be clearly visible to the instructor but not to the class. By merely tracing over these pencil lines with chalk a neat and accurate drawing may be quickly made as the class observes. Chalk that has been shaped flat on two sides will aid the instructor to make lines that are neat and even.

Where the same basic outline of a drawing is needed several times it may be transferred to the board as desired by means of a stencil. This is done by making the drawing on ordinary tracing or wrapping paper. The main line intersections and reference points are then punched or perforated with a pin to make a stencil. By hanging the stencil on the board and patting over the pin points with a dusty blackboard eraser the design will be transferred and the chalk lines may be added as desired.

When a semipermanent drawing is desired, show-card color may be used. The blackboard eraser will not remove the show-card color and when it is no longer needed it can be washed off with water.

Models, Cutaways, and Actual Equipment: Models have several advantages over other training aids. They do not require a darkened room. They may be examined and handled by trainees, and they show relationship of parts better than any other aid.

Cutaway models are used chiefly to show location and movement of internal parts of equipment. See Figure 9.

Actual equipment, mounted or displayed is valuable for close examination and adjustment.

Working models, either large or small scale are valuable in demonstrating the operation of tools or machines.

Suggested Procedure for Using Models:

1. Select or make the models needed. Many of the best models are made from a few pieces of scrap material and paint.

2. Mount these so that they can be seen and used conveniently.

3. Plan their introduction into the lesson and the remarks you will make about it. Do not plan to pass the model around the class as you talk about it or some other part of the lesson. This only causes confusion.

4. During the lesson and when the model is being used make sure it can be seen. An assistant may be used to help handle or hold the model. Do not allow trainees to crowd up so that some cannot see.

5. Provide for the model to be examined by trainees in an orderly fashion after all have had the proper instruction on it.

Local building trades apprenticeship committees should make sure that apprenticeship quotas in each community are filled. These quotas are worked out in proportion to the number of skilled workers needed. They must be filled if the industry is to maintain a skilled working force large enough to carry out the building projects scheduled. In many local communities, the normal ratios are being changed to develop the skilled workers needed for the work now available. — *William F. Patterson.*

There were 2450 deaths due to firearm accidents during 1944. — *National Safety Council.*

Evaluation of Student Progress in the Industrial Arts

*Marcus E. Erickson**

Recently an informal student discussion brought forcefully to my attention the question: Are students in our public schools merely *getting by* and being graduated year after year; or are they meeting certain objectives in their educational experience? This discussion further revealed that many students very seldom or never accomplish the school objectives in even a small measure but still *pass* with their social group. Among seventh-grade classes, for example, are students with first- and second-grade reading ability. Other phases of their development are lacking to a like degree. Appalling? No, that is too mild a recognition of the fact that one third of the high school population is unable to communicate effectively through speech and writing with their teachers.

Industrial-arts students are no exception. When report card time comes around it is too often the practice of too many industrial-arts teachers to mark on the basis of their student's ability to keep out of trouble while *tinkering* with tools and materials, or for being a good boy while the instructor made most of his project. The industrial arts are a part of the general education program and have a definite contribution to make to individual development. Industrial arts is not to be looked upon as a relaxation from the academic curriculum. Industrial-arts education is active participation in industry and its related activities. To effectively explore the many ramifications of industrial life, the industrial-arts curriculum must provide considerable opportunity of an academic nature as well as manipulation of tools and materials. Too often it is the industrial-arts instructor's fault when administration increases the number of failing students in industrial arts because "shop is easier than the academic subject in which these students cannot make the grade." It is obvious that the standards of attainment in the industrial arts must be raised to equal that of any other part of the school program. Also, industrial-arts teachers must be able to state their philosophy and objectives fluently and with meaning.

Evaluation Program Needed

In making the industrial-arts curriculum comprehensive there naturally follows the question of the evaluation of student progress. To measure pupil growth by merely considering evidence of degree of mastery of certain facts, skills, and principles is missing the mark in today's world. In recent years learning concepts have gained prominence in which the whole individual is considered as he interacts with his environment. His interests, attitudes, ways of thinking, personal creativeness, self-evaluation, and adaptability become part of his experience. The implication that these effects have upon learning experience requires newer concepts and techniques of evaluation.

Evaluation Part of the Educative Process

It is suggested that evaluation become an integral part of the educative process. Evaluation may be defined in terms of its "function as the identification or formulation of ever changing goals . . . in a continuously changing environment; the definition of ways of achieving their goals; the construction of valid, reliable, and practical instruments of appraisal; and the application of these instruments to assess outcomes of the goals. . . ." This observation by the National Education Association in its *Newer Instructional Practices of Promise* from the twelfth yearbook reinforces the conclusion that measurement, appraisal, and evaluation must be continuous rather than a periodic consideration when the report cards are issued.

Evaluation More Than Giving Tests

It should not be the reader's interpretation of the foregoing statements that he should begin giving batteries of tests and examinations and call the procedure an evaluation program. Such terms as *estimating*, *judging*, *appraising*, and *evaluating* connotate techniques beyond and more inclusive than tests and examinations. Mere measurement tends to deal in cold facts whereas evaluation is more specific and considers the local situation where the individual and surrounding influences are concerned.

Purposes of an Evaluation Program

If industrial-arts instructors are going to gain and hold a place of respected achievement with other phases of the educational program, they will have to consider an effective evaluation system very seriously.

Of prime importance in any evaluation program is that it must have its basis in the philosophy and objectives of the industrial-arts curriculum itself. This is often forgotten and mechanical measurement of formal skills and the repetition of facts is the result. Thus, if evaluation is continuous and in terms of well-defined objectives, these objectives become clearer and often result in reformulation of aims to meet student needs. This leads to refinement of the evaluation program.

Developing an Evaluation Program

Test situations and appraisal instruments should be appropriate to the outcomes desired. Whether the outcome is memory motor skill, mental skill, manual manipulative skill, appreciations, social-moral traits, habits, or understandings, the evaluation instrument must be designed

Mid-term Home Report

INDUSTRIAL-ARTS DEPARTMENT

Date_____ 194____

_____ is not doing the work of which (he) (she) is capable. This notice is sent to request your cooperation in improving this work before the time of the quarterly report. Need for improvement is checked below:

DESIRABLE INDUSTRIAL TRAITS	★ ATTITUDES ★	★ ORGANIZATION ★
★ WORKMANSHIP ★	8. Interest	16. Clean up Responsibilities
1. Accuracy	9. Initiative	17. Proper Return of Equipment
2. Speed of Accomplishment	10. Cooperation	18. Care of Supplies and Equipment
3. Use of Advanced Processes	11. Reliability	19. Follows Safety Rules
★ PLANNING ★	12. Respect for Rights of Others	★ RELATED ACTIVITIES ★
4. Completeness of Details	13. Concern for Value of Materials	20. Uses Industrial Vocabulary
5. Quality & Use of Drawings	14. Meets Financial Obligations *	21. Knowledge of Subject
6. Accuracy in Computing Bills of Material	15. High Moral Standards	22. Related Information
7. Originality of Ideas		23. Study Habits
		24. General Application

*Owes for cost of materials used.

Signature of Teacher _____

Please sign and return _____

Fig. 2. Report card

*New Haven, Conn.

Industrial-Arts Progress Record

NAME _____ DIVISION _____ GRADE _____ HOME ROOM _____ CLASS DAYS: M T W T F

WOODWORK DEPARTMENT M. E. ERICKSON, INSTRUCTOR

DESIRABLE INDUSTRIAL TRAITS — School Weeks →	CHECKS INDICATE NEED FOR IMPROVEMENT †																				END OF MARKING PERIOD INDICATED BY A HEAVY LINE																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
★ WORKMANSHIP ★																																								
1. Accuracy																				1.																				
2. Speed of Accomplishment																				2.																				
3. Use of Advanced Processes																				3.																				
★ PLANNING ★																																								
4. Completeness of Details																				4.																				
5. Quality & Use of Drawings																				5.																				
6. Accuracy in Computing Bills of Material																				6.																				
7. Originality of Ideas																				7.																				
★ ATTITUDES ★																																								
8. Interest																				8.																				
9. Initiative																				9.																				
10. Cooperation																				10.																				
11. Reliability																				11.																				
12. Respect for Rights of Others																				12.																				
13. Concern for Value of Materials																				13.																				
14. Meets Financial Obligations.*																				14.																				
15. High Moral Standards																				15.																				
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17. Proper Return of Equipment																				17.																				
18. Care of Supplies and Equipment																				18.																				
19. Follows Safety Rules																				19.																				
★ RELATED ACTIVITIES ★																																								
20. Uses Industrial Vocabulary																				20.																				
21. Knowledge of Subject																				21.																				
22. Related Information																				22.																				
23. Study Habits																				23.																				
24. General Application																				24.																				
DAILY — A																																							
CUMULATIVE — B																																							
RECORD ⅀ — C																																							
D																																							
* Supply Card Paid [1] [2] [3] [4] [5] — F																																							
CITIZENSHIP GRADE . . .																																							
Home Report Sent Out ⅀																																							
Home Report Returned ⅀																																							

OPERATION TEST (INDICATE BY NO. AND GRADE)

Date Project was Begun. (Indicated by Project No. as Listed Below.)

Date Project was Finished. (Indicate by Project No. and Grade)

Examination Grades (Indicate by Examination No.)

Bench No. _____

Average for Year _____

Final Exam. Grade _____

FINAL GRADE for YEAR

Scholarship _____

Citizenship _____

† Position of Checks (√) in the Square for any one Week Indicates Records on Days as Follows: ☐

Fig. 1. Progress chart

accordingly. In *the American School System* by A. A. Douglass it is noted that "studies have shown that teachers have not thought clearly upon the purposes they expect to achieve . . . and that appropriate instruments and techniques have not been developed." Industrial-arts teachers seem to have little trouble in designing instruments to test the memory of information, recognition of tools and materials, and the manipulation of tools. These tests fall short when it comes to the adequate evaluation of "attitudes, emotional reactions, choices, and values. These latter are patterns of behavior that inherently do not express themselves in single isolated elements of behavior." These quotes from *Dynamics in Education* by Hilda Taba appeared in her chapter on "Behavior and Learning" for testing and evaluation are in themselves learning situations.

Types of Measuring and Evaluation Instruments

Measurement and evaluation are most meaningful when instruments are selected and designed to fit a specific situation. The following outlines briefly some of the general types of evaluation instruments that the industrial-arts instructor may well use to advantage. Many of the types suggested may be found by referring to back issues of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine. Others the teacher will have to design himself:

1. General traditional essay-type examination. Example: Discuss the making of shellac.
2. Improved essay-type to test *specific* outcomes. Example: Discuss the care of the try square.
3. Standardized and published objective tests. These are of the multiple-choice, true-false, one word answer, and matching types.
4. Teacher mode objective tests.
5. Problem situation tests. Here you can ask for demonstrations, work on actual jobs in daily living, and problem situations in the form of questions.
6. Behavior records in the form of check lists, rating scales, motion pictures, photographs, and time studies.
7. Inventories and questionnaires.
8. Interviews.
9. Analysis of projects.
10. Reports and exhibits.
11. Case studies.

Instructors will find it less difficult to find and devise means to measure facts learned by the student. But more attention must be given to judging the sensitivity to social relationships, handling of equipment, scientific thinking, values, interests, and appreciations.

Suggested System for Recording Student Progress

In previous issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION there have appeared suggestions for evaluating some of the more difficult areas of behavior. The organization of the progress record suggested in Figure 1 has drawn from those sources as well as from the writer's experience. At the top of the form space is provided for the student's name, etc. Days on which the class meets will be circled, for in some schools classes may meet only one day a week and in others five days. Down the left side of the record are listed the industrial traits which are the basis of a *daily* evaluation of the student's progress. The reader may be able to make improvements to fit his local need. Across the top the columns are numbered to represent weeks in the school year.

In using the record the instructor will indicate with a small check in the appropriate square deficiencies in the traits listed. If the class meets more than one day a week the *position* of the check in the square shows the day on which the check was recorded. (The writer has a calendar pasted in the cover and school weeks are numbered to match the record.) At the bottom of the record the key to the position of the checks for each day is indicated by initials of the days in the appropriate place in the key square.

On the right side at the top is a note to indicate the horizontal line to be used in recording operation tests, student demonstrations, special jobs, and the like. Below this is space for indicating the status of projects. The number, name, and cost of project can be written in as desired. There is also space for recording examination grades by inserting the grade and examination number for identification. Summary of grades, etc., is recorded in the lower left corner.

In any one vertical column observation of the checks and grades for a given week will provide a basis for a letter grade at the bottom if one is required in your school. The weight to be placed on each item in the list will be controversial; but it is quite agreed that for some students workmanship is the real need and consideration, for others planning, and so on down the list. After the instructor gets to *know* his students and uses the record a glance at the checks in the column will give quite an objective picture which can be translated to a letter grade in the daily *Cumulative Record* below. If the grade for the column is a *B*, place a *dot* in the *B* square. Each week the dots are connected to form a continuous graphic picture of student progress. The end of the marking period is indicated by a heavy line. A glance at the graph will reveal the average grade which is then written over the heavy line (or a break in the line for more clarity). If determining the average grade in this manner doesn't sound scientific, check it mathematically. The results are usually the same. If a citizenship grade is required, space is provided.

It will be noticed that the record shown here was designed for woodwork. A few minor changes will make the record adaptable to any phase of industrial arts. The record sheets are bound into a book with a convenient plastic binding which allows the book to be opened flat for easy use. Classes and divisions may be found quickly by pasting in thumb tabs at the right points.

Home Report to Match Progress Record

To keep parents informed of deficiencies between report cards, the form in Figure 2 can be sent home. The date of sending and returning this form is recorded at the bottom of the record in the space provided.

In schools using a supply card for paying for materials, its purchase is checked off in the lower left corner. If, for instance, the cost of such a card is a dollar, and the cost of projects is given with the project on the right side of the record, the two items can be readily compared to check the student's care of financial obligations.

Advantages of the System Suggested

To the instructor who has not used a comprehensive means of evaluation the system described may appear cumbersome and laborious. But in the writer's experience it has proved a *timesaver* in record keeping and is a constant reminder of the educational objectives to be attained for each student. By interviews with students in which they have a look at the record they develop a conscious effort to improve the weak spots — clear up the checks in future days. And practice shows the checks for deficiencies *do* appear less and less. Further, the record *shows* individual progress, accomplishment, deficiencies, and trends; it is a basis for information for reports to parents; and it is convenient for use in interviews with both students and parents.

It must never be forgotten that the first purpose of records is that of forming a basis for *understanding individuals* so that guidance and future learning activities may be planned.

In recapitulation E. G. Olson in his *School and Community* emphasizes that "throughout the progress of every . . . evaluation project, both the teacher and the class will want to ask, 'How are we doing? Are we accomplishing our purposes?' At the conclusion of the experience they will inquire: 'Just what was accomplished? How effectively did we work? What did we learn from this experience that we can use in the future?' Such, in brief résumé, is modern evaluation in the democratic manner. Its results will be to improve teaching effectiveness, vitalize curriculum content, and demonstrate worth-while learning to the community itself."

Industrial-arts educational experience for the whole child as an individual needs continuous judgment by student and teacher. *Only* as there is a recurring program of evaluation of effort will the student be able to know whether he is making progress in the achievement of school objectives.

Teaching Related Work

*James F. Morgan**

Related work, related subjects, related studies, related information; what do these terms mean? To most of us they have the same meaning; i.e., material relating to the shop instructional unit.

Related instruction may be divided into two divisions — technical and general related information. Technical information is that information which is necessary in order to form judgments on the job and without which the worker cannot climb above a helper's position. General information is that information which is not necessary to the successful conclusion of the job, but is well to know as it builds the background of the individual.

The technical information can be divided also into two divisions — that which is necessary to the successful progress of the work and must be taught at the time needed in the progress of the instructional unit as a whole; that which is necessary to a full understanding of the work and which enables the worker to exercise judgment in doing the work.

The first of these divisions must be taught in the shop at the time it is needed. The second may be taught in the shop or in a classroom separate from the shop and by another instructor than the shop instructor. General information is frequently taught outside the shop.

The technical information which forms the theories basic to the understanding of shop principles and applications are sometimes not thoroughly understood by the average shop instructor. Therefore, these theories and basic background studies may better be taught by other than the shop instructor. As an example of what is meant, let us examine the teaching of decimal equivalents of the fractions of an inch. The shop instructor is interested only in the memory recall of these equivalents. The related studies or related work's teacher must, therefore, teach the method of finding these equivalents, the use of decimal tables, and how they can be learned most easily in order to retain them in the memory.

In our classes of related work, we try to teach first the basic theory or operations necessary to a fuller understanding of the applications and then make the application.

We use several different methods of teaching necessitated by the fact we have two shops and from two to four grade levels of each shop represented in the class. Instruction sheets have been and are being prepared in the form of information and assignment sheets as rapidly as possible as aids in teaching.

We have a very good related studies library which is kept in our related studies room. There also are additional books and periodicals in the main library of the school.

In preparing the instructional material, conferences are held with the shop instructor to get his viewpoints and ideas on the particular subject to be discussed in order to get the connection with the shop activities. References are looked up, read, and notations made. From these, only the very important facts are gleaned and worked up to form a smooth reading, simple, logical discussion of the subject.

The *information sheets* do not conform to the recommended procedure, but give the pertinent, necessary information which we are most anxious for the student to know. Examination of the accompanying sheets will show that there are no questions or references listed. They are truly information sheets and thus become references for the *assignment sheets*. We would like to call attention to the *information sheet* on "subtraction of whole numbers." Notice that there are no rules given for the subtraction, but a number of steps are given. This is done to make our related work, where possible, take on the appearance of shop procedures. Rules should never be memorized, but learned by using them over and over a sufficient number of times to fix them in the mind. We have been successful, thus far, in using this method of teaching mathematical procedures. Examples are shown of information sheets in arithmetic and radio theory.

Examination of the accompanying assignment sheets will show the following sections: (1) subject, (2) field or shop for which prepared, (3) assignment number, (4) references, (5) directions, (6) the problems or questions to be answered.

The references are in detail giving the exact page number. The directions tell what is to be done, and if any special information is needed to do the work successfully it is given at that time. Examples are shown of assignment sheets in arithmetic, physics, soldering, and radio theory. Not all the questions may be answered from the study of the information sheet but all can be answered when the references are studied along with the information sheet. These sheets are used by giving them to the students with an explanation of their use and where the references may be found. When help is needed by the student, he comes to the instructor for an individual conference.

Other methods of instruction used in our classes are: first, lecture method. Here, when possible to have all of one group working together on the same thing, a lecture is given with necessary illustrations. The illustrations may be sketches, graphs, or diagrams prepared ahead of time in the form of charts or drawings on the blackboard. They may be sketches drawn on the blackboard as the lecture is developed. Or, models may be used as a part of the illustrative material. Demonstrations are sometimes made during the lecture period when they will help put over the ideas being discussed.

Second, the laboratory method of instruction is used in teaching science and radio, as illustrated in the assignment sheets.

Third, visual aids are used as a means or method of assistance in teaching. Both motion pictures and film slides are used. Whenever possible these are previewed ahead of class time and notes taken of the content. In the case of the film slides, especially, an assignment sheet is worked up in the form of questions, diagrams drawn with names of parts to be filled in, or diagrams to be drawn by the students. These sheets are given out after the showing of the picture. The class is told what to look for in the picture and to expect a test afterward. The picture is shown with the necessary discussion upon conclusion of which a short rest period is given and then the assignment sheet is given out to be filled in by the student. If the number of errors is great, the picture is shown again to clear up these misunder-

*Instructor, Related Studies, Hume-Fogg Technical and Vocational High School, Nashville, Tenn.

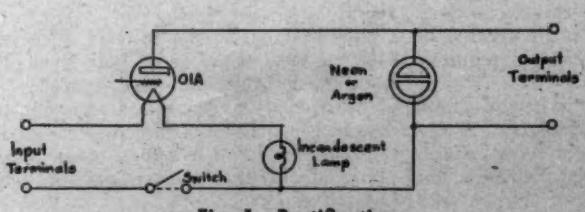

Fig. 1. Rectification

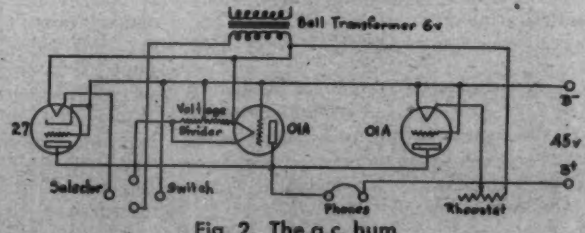

Fig. 2. The a.c. hum

standings. In our classes where this method has been used our average per cent of retained information after the first showing has been 90.

Fourth, mock ups or simplified models are used as teaching aids. The apparatus for illustrating the rectification of a.c. current to d.c., for instance, is diagrammatically shown in Figure 1. This diagram is taken from *Elements of Radio* by Marcus and Horton, published by Prentice-Hall, Inc., page 651. Figure 2 shows a group of circuits, any one of which may be used through a selector switch for showing the successive steps employed in the search for a means of eliminating the a.c. hum in a vacuum tube.

Figure 3 illustrates a simplified automobile lighting system with means provided for measuring the current flow in the different parts and the voltage drop across the different parts. The diagram of Figure 3 shows the wiring connections.

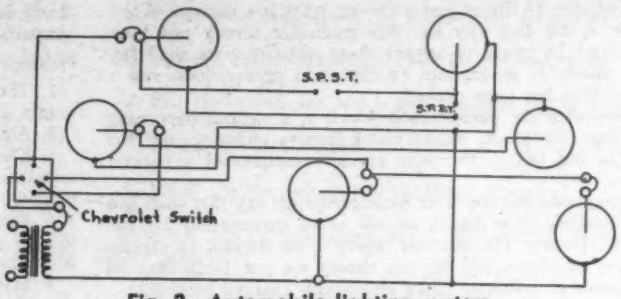

Fig. 3. Automobile lighting system

Fifth, other help is secured from use of materials such as is furnished by Behr-Manning Company, Carborundum Company, Joseph Weidenhoff, Inc., Studebaker Corporation, Westinghouse Electric Company, Allis Chalmers Company, and General Electric Company.

The INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine has been carrying a listing of source materials during the past two years, from which much helpful material may be secured.

Typical Information Sheets

Subject: Subtraction of Whole Numbers
Field: Electricity *Information Sheet* E 5

Subtraction is the process of finding the difference between two numbers. This is just the opposite of addition in which the sum of two numbers is found.

If the sum of $4+5$ is 9, the difference between 9 and 5 is 4 or between 9 and 4 is 5. This transaction would be written, $9-5=4$ or $9-4=5$.

To subtract one number from another we write the number to be subtracted under the number from which the subtraction is to be made. As in addition, the digits should be kept in the proper columns. In subtraction each of the three numbers involved has a specific name. The number from which the subtraction is made is the minuend; the number being subtracted is the subtrahend; and the number found by the subtraction is the difference. The difference, then, is the number which if added to the subtrahend, would give the minuend.

Step 1. Write the subtrahend under the minuend, keeping the digits in the proper order, and in the proper column.

Example: Subtract 375 from 545
Solution: 545 Minuend
375 Subtrahend

Step 2. Subtract the first figure on the right of the subtrahend from the first figure on the right of the minuend and write the difference in the same column below.

Example: 545 Minuend
375 Subtrahend

0 Difference

Step 3. Continue the subtraction, moving one digit to the left each time until all the digits have been used.

Example: 545 Minuend
375 Subtrahend

170 Difference

In the example, the 7 which is the next figure to the left in the subtrahend is greater than the 4, the second figure to the left in the minuend. To make the subtraction borrow one from the five. This one is in the tens place so far as the 4 is concerned and therefore is 10 when added to the 4 making it 14 instead of 4. Now, 7 from 14 is 7; so write 7 in the second place to the left in the difference. Continuing, 3 from 4 (which was left after the one was borrowed from the 5) is 1. Write the 1 in the difference under the 3 and the solution is complete with the difference between 545 and 375 being 170.

Electron Theory *Electricity — Radio 3*

Matter, Protons, Electrons

Nature, which is all around us, seems to be made up of matter that is in almost continual change. Change we say seems to be the order of nature. Then, what is matter? We are told by many that it is futile to try to define matter. H. A. Overstreet of City College, New York, says that the hard tangible lumps of solid matter — the atoms of the nineteenth century — have been so torn down that the matter of today is infinitely tenuous and elusive; it is a "wave of probability undulating into nothingness." Most physicists today, however, define matter as anything that has weight and occupies space.

Now, that we have to the best of our ability defined matter, let us examine the forms in which we may find this thing we call matter. Matter is found in one of three forms; namely, solid, liquid, or gas. Solid matter is that which does not change its shape under slight pressure at ordinary temperature. If under slight pressure at ordinary temperature the shape of the body is changed it is no longer a solid, but is called a fluid. Fluids are divided into two classes. Those fluids which take the shape of the vessel into which they are poured are called liquids and those which expand to fill entirely the containing vessel are known as gasses.

All matter in whatever state — solid, liquid, or gas — is composed of minute particles called molecules. These molecules are separated from one another by space. Gases in general have small density and therefore the free space between molecules is very much greater than the volume of space occupied by the molecule itself. As we change the state of matter from a gas to a solid this matter of free space between molecules grows smaller but never completely disappears.

The molecule is made up of atoms. In some molecules these atoms are held together by the attraction of the protons of one for the electrons of the other, or by the taking of an electron or electrons from the one to fill the outer ring of the other. When this condition obtains, the atoms do not touch but are held together by the attraction of the electrons and protons. The molecules are held together by a force called cohesion. Therefore there is space between the molecules and between the atoms in the molecules. Again, atoms are made up of electrons and protons. The protons are located in a rather fixed position within the atom while the electrons revolve in orbits around this nucleus. These electrons do not touch one another within the atom and revolve in different shells at different distances from the center. There must be space in the atom through which these electrons may move. Therefore, we say that all matter is mostly empty space. Let us now examine some suggested possibility of the size of this space. We are told that a pinhead in a large church auditorium may be likened to the nucleus of an atom and the tiny pin point as an electron. The auditorium represents the whole space of the atom. Another source says that if we consider the nucleus of an atom as the size of a baseball the electron would be about the size of a BB shot, while the first orbit in which the electrons move would be several feet from the ball the other orbits being many miles away.

All of this space in a solid is extremely hard for us to perceive. Consider, for instance, we read that the actual material which can be called solid in an average human body (electrons and protons) may be compressed to a volume less than one cubic millimeter. Berkeley, the philosopher, said that for him matter did not exist except when he could perceive it through one of his five senses. He believed, however, that it still did exist even though he was not present to behold it, because a Supreme Being was ever present to perceive it. Leibnitz says that our soul or mind obtains a reasonably clear view of the world, but we are still confused by its conception of matter as apparently real. Only to God is the real nature of matter revealed. Therefore, we, because of the grossness of our vision and powers of perception, cannot perceive the space in matter.

We have been discussing in these lessons what is known as the elec-

tron theory of matter. If this is just a theory, what is a theory? When does it become a law and why has this particular theory not been accepted as a law? In trying to answer these questions, we shall say briefly that a theory is an attempt to explain a phenomenon and a law is a theory that has been proved.

Physics begins with the phenomenon which is a natural happening in nature. Falling rain, snow, smoke rising from a chimney, and the falling leaves in the fall of the year are all examples of a natural phenomenon.

Seeing this phenomenon take place we immediately say that such and such was the reason. This reason set up as an explanation for the phenomenon is a theory. The electron theory is an attempt to explain the phenomenon of electricity. In this theory we put forth that all matter is composed of infinitely small electrically charged particles.

A law is a definite scientific statement about a phenomenon which may be verified by experiment. Let us take Pascal's Law as an example: "Pressure applied to a given area of a fluid enclosed in a vessel is transmitted undiminished to every equal area of the vessel."

By the truth of this law a small force may be applied to fluid in a container and a large resulting force be achieved. This principle is used in the hydraulic press and makes possible the hydraulic brakes.

Laws are statements made as results of experiments. An experiment is a question asked of nature. To find the answer to this question many tests and measurements are made. All experiments are based upon the assumption that under the same conditions nature will always act in the same way.

The electron theory explains much of our science of chemistry and electricity. Although the actual theory of electrical charges has been proved, it has not yet been accepted as a law because there is much to be explained that has been made clear and much that has not been made clear. However, for electrical purposes, especially communication, the theory is very satisfactorily explained. Thus our modern conception of matter is now based on the electron theory.

We shall now summarize the study of the basic facts of the electron theory with some statements about the proton and the electron with a comparison between the two particles.

Protons:

1. The proton is a part of the atom which gives to the atom its weight and composes half the number of particles in the atom.
2. All the protons are in the nucleus of the atom.
3. The proton bears a positive charge of electricity. The number of unbalanced protons in the nucleus determines the strength of the positive charge of the atom.
4. Protons have no motion of their own, but move with the atom in a to-and-fro motion.

Electrons:

1. Half of the number of particles in the atom are electrons. The weight of the electron is so small as to have no part in the weight of the atom.
2. Half of the number of electrons are in the nucleus and about half in the outer space of the atom around the nucleus.
3. Electrons bear an elemental negative charge of electricity.
4. The electrons revolve in orbits about the nucleus with high velocities, as well as having the motion of the atom itself.

Electrons and Protons Compared:

1. Weight: The weight of the atom is determined by the number of protons. The weight of the electron is so small as to be negligible. The proton weighs 1845 times as much as an electron.
2. Position in the atom: All the protons of the atom are in the nucleus. Only about half of the electrons are in the nucleus while the other half are in the outer space about the nucleus.
3. Electrical charge: The protons bear an elemental positive charge of electricity. The electrons bear an elemental negative charge of electricity.
4. Motion: Protons are stationary except as the atom moves. Electrons have a planetary motion about the nucleus and in addition the motion of the atom itself.

Typical Assignment Sheets

Name———— Date Due———— Date Finished————

Subject: Subtraction of Whole Numbers

Field: Electricity *Assignment Sheet* E 5

References: Information Sheet

Hobbs, Glenn; McKinney, James; Dalzell, Ralph. *Practical Mathematics*, pp. 1–4, American Technical Society, Chicago, 1940.

Thompson, J. E., *Arithmetic for the Practical Man*, pp. 10–11, Van Nostrand Company, Inc., New York, 1931.

Lennes, N. J. *Practical Mathematics*, pp. 14–15, The Macmillan Company, New York, 1937.

Directions: After careful study of the above references, solve the following problems.

1. Subtract:

9	6	8	5	3	7	2	9	6	8	7	4
7	4	5	2	1	0	1	5	3	4	3	2
—	—	—	—	—	—	—	—	—	—	—	—

2. Find the difference between the following numbers:

23	36	44	82	47	99	58	68	95	30	76	88
15	26	32	58	31	68	47	39	47	17	28	45
—	—	—	—	—	—	—	—	—	—	—	—

3. Subtract:

478	689	783	963	489	980	723	342	768	870
367	398	528	567	176	216	243	332	124	467
—	—	—	—	—	—	—	—	—	—

4. Subtract:

4658	5243	8067	3760	5577	7680	5689	8833	8007
4539	4372	5285	2871	4729	1200	1144	4567	3366
—	—	—	—	—	—	—	—	—

5. Subtract:

98076	78062	12004	94302	21905	10470	88332	66884
67598	34078	11443	54387	19576	2480	39470	32886
—	—	—	—	—	—	—	—

6. Perform the indicated operations:

3867	6789	4532	94302	47293	58468	65478
+2805	−4670	+2439	−10067	+56470	+ 4778	−43956
—	—	—	—	—	—	—
−3076	+1107	−4230	+45980	−78679	−23007	+48766
—	—	—	—	—	—	—

Motor Mechanics *Science 2*

Experiment 4. Vapor Pressure

Object: To show that the vapor from some liquids evaporating in a closed container will exert a pressure.

Apparatus: Two 2-ounce bottles, 2 rubber stoppers with one hole to fit the bottles, 2 glass tubes closed at one end, and an electric hot plate.

Materials: Alcohol, water.

Procedure and Observations: Fill one bottle about half full of alcohol and the other about half full of water. Be sure the amount of liquid is the same in each bottle. Put the glass tubes through the holes in the rubber stoppers in such manner that the closed end of the tube will be up when the stoppers are placed in the bottles. Place the stoppers with the tubes in the bottles adjusting the tubes so that the lower end will be slightly above the bottom of the bottle. Place the two bottles side by side on a hot plate. Turn on the current and heat the liquid until its temperature rises about 15° or 20°. The apparatus as set up will appear as shown in Figure 1.

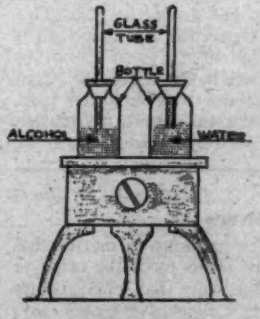

Fig. 1

What effect does heating the liquid have upon its rate of evaporation?

Does the liquid rise in the tubes after being heated? Why?

Which liquid rises the higher and why?

What is vapor pressure?

Name——— Date Due——— Date Finished———
Subject: Soldering Fluxes
Field: Radio *Assignment Sheet* R 10

References: Information Sheet No.
Stanley, *Expert Soldering*, pp. 4–6.
United States Army Signal Corps and U. S. Office of Education, *Mechanic Learner–Radio*, 1942. Job 1, p. 3.
Radio Material School, *Mechanical Practice*, 1943, pp. 1–2.

Directions: Study the above references carefully. Answer the following questions in complete sentences.

1. What is a soldering flux?
2. What does a soldering flux do when a soldered joint is made?
3. The two types of fluxes are ———.
4. Why is rosin flux used exclusively in radio work?
5. In what forms may rosin flux be obtained?
6. How is zinc chloride flux prepared?
7. What precautions must be taken when rosin flux is used?
8. List the metals for which rosin flux is best used?
9. List the metals for which zinc chloride flux is best used?
10. Name the acid fluxes.
11. What are the two special soldering fluxes?
12. What special precaution must be observed when using acid fluxes? Why?
13. For what purpose in soldering should sal ammoniac be used?
14. What precaution should be observed in using acid fluxes with a soldering iron?
15. What kind of flux should always be selected for a given job?
16. What is meant when it is said that a flux is corrosive or non-corrosive?

Name——— Date Due——— Date Finished———
Subject: To show how the diode acts as a rectifier
Field: Radio *Assignment Sheet* R 15

Object: To study how an alternating current may be changed to a direct current by means of a vacuum tube.

Apparatus: Diode tube rectifier board, source of 110-v. a.c., source of 110-v. d.c.

Materials: Line cord, O1A vacuum tube, 2-watt split-plate neon or argon lamp, 25-watt incandescent lamp.

Procedure and Observation: Complete the diagram of Figure 1 to show how the apparatus board is connected.

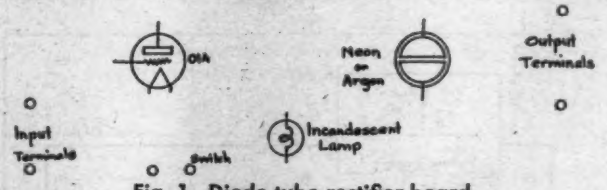

Fig. 1. Diode tube rectifier board

In the two following questions, place the letter of the phrase which correctly completes the sentence in the space provided at the left of the question.

1. Connect the 110-v. a.c. source to the output terminals of the board.

( ) *Question.* The effect on the neon or argon tube is to cause: (*a*) only one plate to light; (*b*) neither plate to light; (*c*) both plates to light; (*d*) the positive plate to light; (*e*) the negative plate to light.

2. Replace the 110-v. a.c. source with a 110-v. d.c. source of current connected to the output terminals of the board.

( ) *Question.* The effect on the neon or argon tube is to cause: (*a*) only one plate to light up; (*b*) neither plate to light; (*c*) both plates to light; (*d*) the positive plate to light; (*e*) the negative plate to light.

Indicate the direction of the electron flow in the diagram of Figure 2 by an arrow with a small *e* at its tail, and the illuminated plate by placing a letter *G* on it in the diagram.

Fig. 2. Direction of electron flow

Is it true that when direct current flows through the neon or argon tube one of the plates becomes positive and the other negative?

Which of the two plates is illuminated when direct current flows, the positive or the negative?

Now reverse the direction of the direct current through the lamp. What change if any takes place?

3. After disconnecting the direct current source from the output terminals, connect the 110-v. a.c. source to the input terminals. (Be sure the switch in the line is open when you connect the line cord to these terminals.)

Close the switch and notice the effect in the tubes of the apparatus.
Does the neon or argon lamp become illuminated? ———
How many plates are illuminated? ———
What does this indicate? ———
What is the purpose of the 25-watt lamp in the filament circuit of the O1A vacuum tube?

Fig. 3. Direction of electron flow

Indicate the direction of electron flow in the diagram of Figure 3 by an arrow with a small *e* at its tail end, and the illuminated plate by the letter *G*.

Foundry at the E. D. Libbey High School, Claude T. Rosenberg, Instructor

Problems and Projects

ELECTRIC ANSWER BOARD

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Brown Street School

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The construction of an electric answer board will vitalize any electric shop course, and the use of such an answer board will prove an ever failing source of interest to all pupils. Bell wiring commonly included in beginning courses in electricity can be highly motivated by the pupil's study of the circuit used in the answer board. The maze of wires at the back of the board may at first confuse the pupil but if the wiring of just one or two answers is traced the whole thing becomes simple and the student is then in a position to be impressed with the fact that a seemingly complex circuit may sometimes be quite simple. The confidence he thus acquires may be just the encouragement he needs to continue his study of electricity.

Construction of Panel

The dimensions and the construction shown in Figures 1 and 2 need not be followed exactly. Many variations are possible. Any plywood panel from ⅜ to ¾ in. thick may be used for the board. An old drawing board of solid wood construction could also be used. Galvanized roofing nails could be used for the fixed contacts instead of machine screws. If nails are used the wires should be soldered to them. Sixteen penny nails may be used in place of brass or copper for the movable contacts. The answer board is held in a vertical position by the two feet which fit over the bottom edge of the board.

Light and Buzzer

A 15-volt Christmas tree bulb serves nicely for the light signal. An old tree light socket set tightly into a hole in the panel takes care of the mounting of the light on the board. An ordinary residence doorbell or buzzer is used as an audible signal.

Solenoid

Do not use any iron or steel in the construction of the solenoid with the exception of the movable core shown at *A* and *B* in Figure 2. This core must be made of soft iron. When assembling the solenoid to the back of the board, be careful to limit the range of movement of the iron core so that the slot in the core will not slide off the core guide. At *B* in Figure 2, the upward movement of the core is limited by a piece of string tied as shown. Another method of limiting the upward movement would be to put two brads in the ¼-in. plywood in such a position that the *right* label holder would strike the brads, thus preventing the core slot from sliding off the core guide. Insulate the brass frame of the solenoid coil with paper before winding.

Wiring the board

Wire the board with No. 20 annunciator wire. Use wire with three or four different insulation colors, if possible. Use No. 16 or No. 18 rubber covered stranded cable for the movable contacts. Run a wire from one of the numbered contacts to one of the answer contacts. Do not follow any numerical sequence in wiring the numbered contacts to the answer contacts. For example, at *B* in Figure 1, contact No. 1 is wired to the third contact in the first answer column. Contact two is wired to the sixth contact in the first answer column. To avoid confusion in the diagram

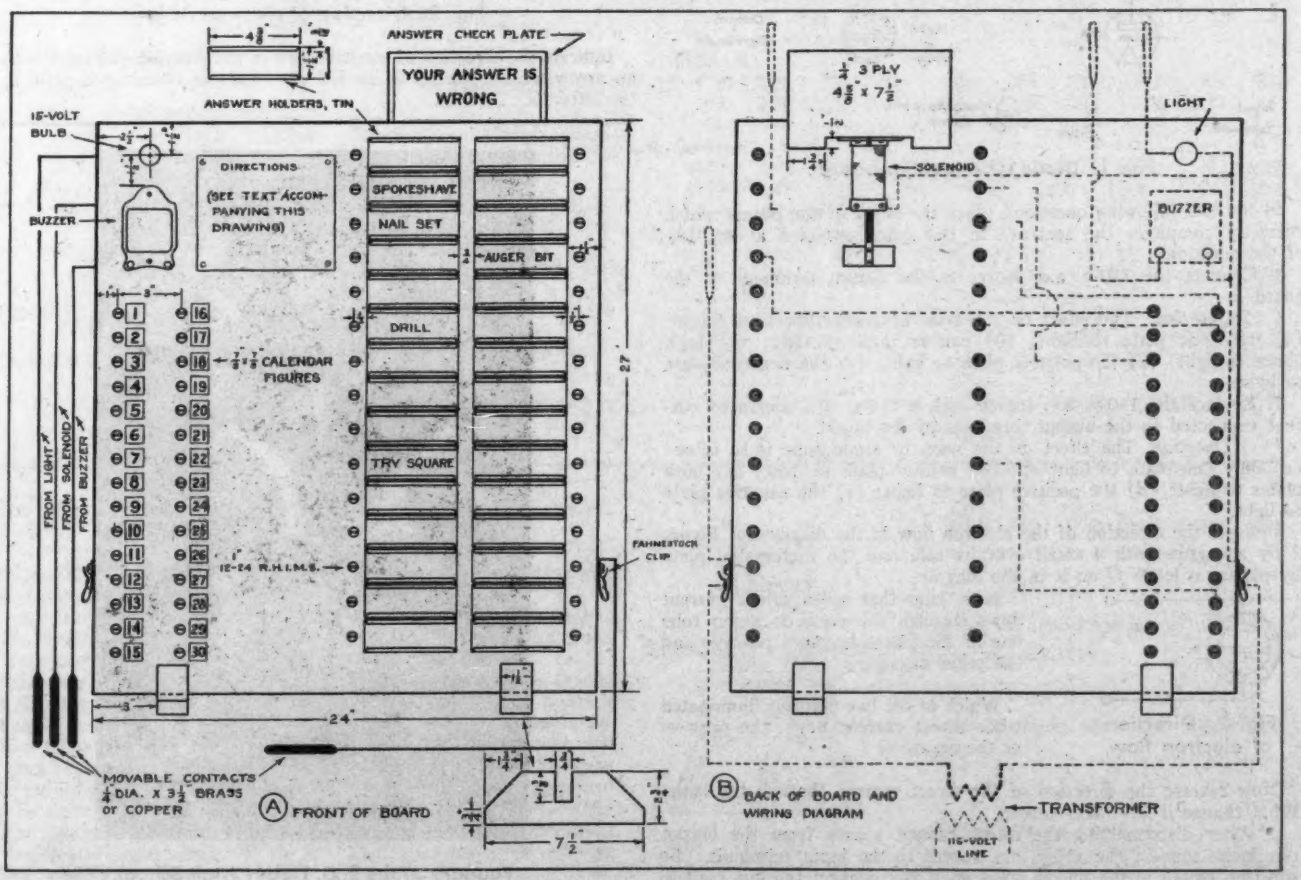

Fig. 1. Electric answer board

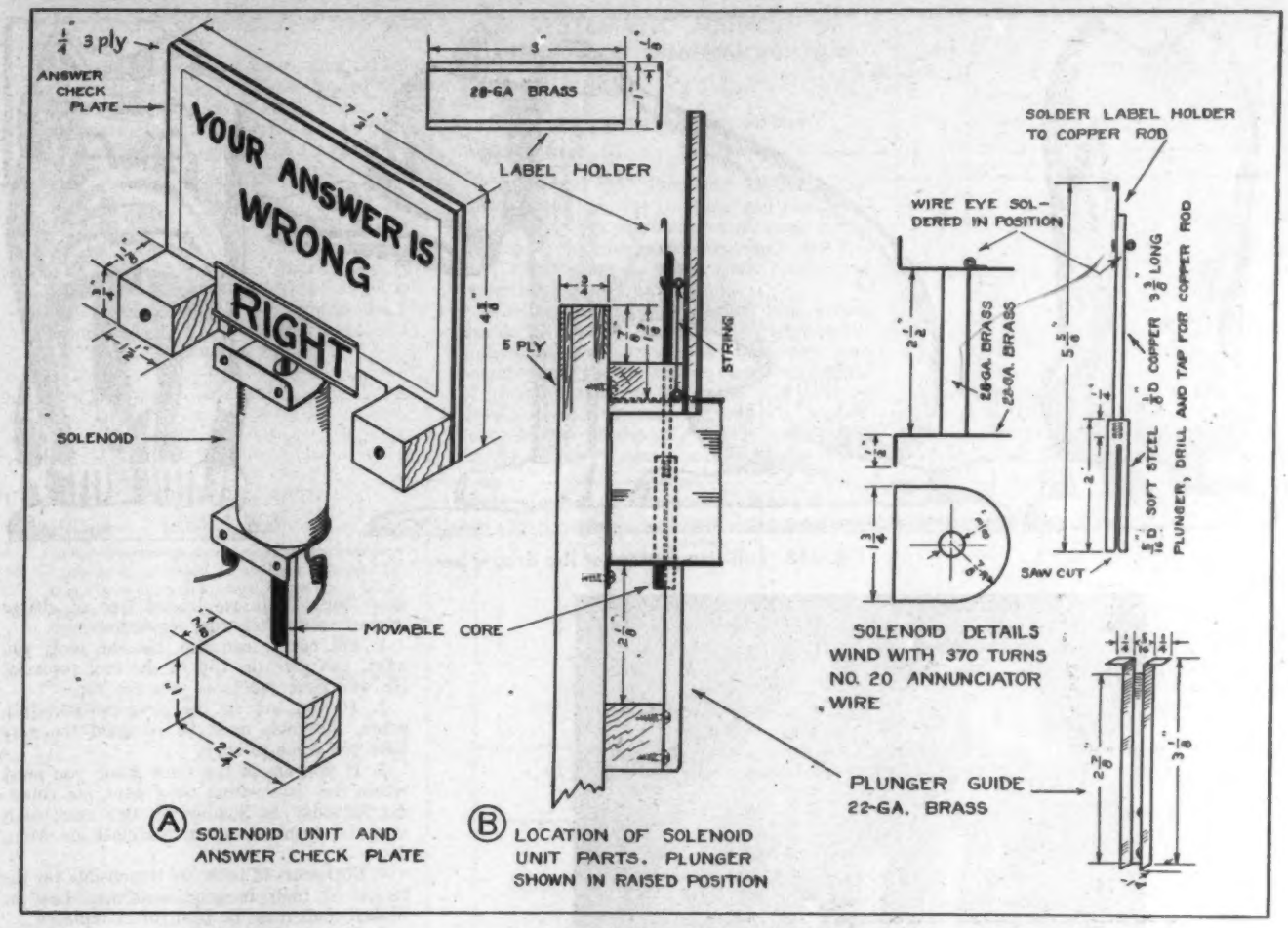

Fig. 2. Answer check-plate details

shown at *B* in Figure 1, only five answers are wired as an illustration. It is obvious that the answer to question one must be located in the third answer holder in the first column of answers and that the answer to question two must be located in the sixth answer holder in the first answer column. After all of the wiring is completed a key can be devised by the instructor which will aid in placing all subsequent answers to other tests without the trouble of tracing the connections as the answers are being placed.

Devising a Test

When devising a test to be given with the electric answer board the objects or parts to be named, or the questions in the test, should all be numbered from one to no higher than thirty, if thirty contacts are provided as in Figure 1. Then considering the numbered contacts at the left of the board take each name or answer and place it in the answer holder which is wired to that particular numbered contact.

A tool recognition test could be arranged by cutting large figures from a calendar and thumbtacking these figures near the various tools on the tool boards. Place the correct tool names in the answer holders being careful to locate the names properly according to the wiring.

A wood recognition test can be arranged by numbering samples of different kinds of wood and preparing labels with the correct names and placing these labels in the proper answer holders.

An interesting and profitable diversion for the boys is an airplane part recognition test. Draw or procure a large, good, clear picture of an airplane. Number the principal parts of the airplane by printing numbers on the picture and running arrows to the parts numbered. Then prepare labels with the correct names of these parts and place them in the answer holders as described above.

Good charts of automobile engines are sometimes obtainable from manufacturers and a recognition test for parts of an automobile engine could very easily be devised with such a chart. If the chart is colored, cut numbers from a calendar and paste them in position on the chart, so that they will be quite easily discernible.

The possibilities for testing in various ways with this device are many, and numerous applications in the academic studies also are possible.

Operation of Answer Board

The three movable contacts at the left of the board are for the light signal, the buzzer, and the answer check plate. Hold one of these movable contacts located at the left of the board on the numbered contact corresponding with the number of the object or part you wish to name.

Hold the other movable contact on the fixed contact near the name of the object or part which you will find in one of the answer holders at the right side of the board.

If you have named the part correctly a signal will be given, with the light, the buzzer, or the answer check plate, depending on which movable contact you use at the left of the board.

Attach operating directions on front of board as indicated at *A* in Figure 1.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT

Hales Corners, Wis.

(Continued from page 326 of the September, 1946, issue)

Drizzly Bear

The awful looking critter shown in Figures 212 and 213 is another one of those caricatures which some whittlers like to make, while others would not give them room on the whatnot shelf.

Once the silhouette, shown in Figure 213, is sawed out, it takes only a short time to whittle this caricature of a bear. It will not even be necessary to saw out the midsection. Just drill a few holes, and since the legs on both sides are alike, the silhouette will be completed with but a few cuts of the knife. Removing the wood between the hind legs at the haunches will be found a bit tedious. However, by cutting with the tip of the knife through the opening between the front legs you will be able to remove the surplus wood.

The drizzly bear can be made to look even more humorous if it is painted. Start at the

Fig. 213. Full-size pattern of the drizzly bear

Fig. 212. The dejected drizzly bear

nose with a light brown and add a little more brown for the body as you proceed. Leave the underpart lighter. Then darken up the ears a bit, paint the nose black, and make the lips and rims of the eyes a bright red. Paint the eyeballs cream or white and draw a short black line across them. The photograph for Figure 212 was made before the figure was painted.

TOOL LOAN LIBRARY

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General Shop Instructor

New York State College for Teachers

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The tool loan library shown in Figure 1, is a unit designed for the shop to function in much the same way as a book loaning library. In urban areas particularly, many homes lack even the simplest tools. Minor adjustments and repairs are often neglected as a consequence or else poorly done with makeshifts. Children living in multiple apartment houses lack both a place and tools with which to pursue a constructive hobby.

The library tools may be borrowed for a definite period of time for home use subject only to the usual precautionary rules set up for their safe return. These rules are posted on the panel along with blank loan cards, shown in Figure 2. The student fills out the card and takes it to the tool foreman who issues the tool or tools requested. The card is canceled when the tool is returned and kept for record purposes.

The library tools are distinguished by color from the regular shop tools. The proper name of each tool is printed on a tab and a silhouette indicates the place for the tool. The name of the school and "property of" is etched on each tool.

The following rules have worked satisfactorily in this situation at Public School No. 18, Buffalo, N. Y., but of course, they may be modified to fit other conditions.

(*Posted on panel*)

The tool library is intended for the use of reliable students who wish to make things or do repairing at home but lack the necessary tools. Tools are loaned free of charge subject to the following regulations:

1. Fill out a loan slip, list the tools you want, and give the slip to the tool foreman. He will issue the tools you ask for.
2. If you are in the seventh or eighth grade, the tools must be returned the *next time* you come to shop.
3. If you are in the sixth grade you must return the tools within *three days*, not counting Saturday or Sunday. In this case, tools must be returned before 9 o'clock on Mondays.
4. Borrowers of tools are responsible for the return of tools in good condition. Lost or broken tools must be paid for or replaced.
5. If you "forget" to return the tools on time, the tool library will be *closed* to everyone until the overdue tool is returned. The name of the person responsible will be posted

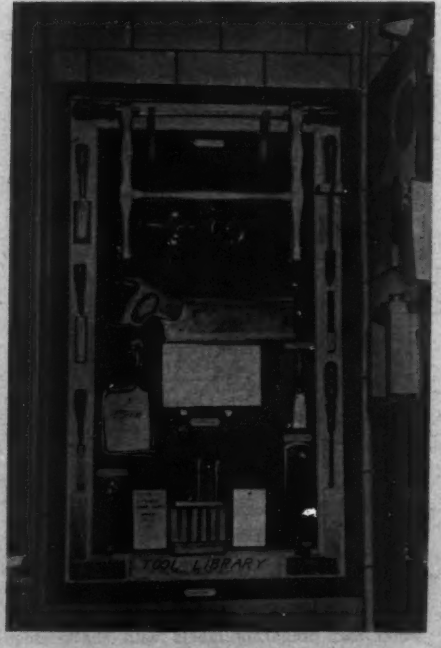

Fig. 1. Tool loan library, Public School No. 18, Buffalo, N. Y.

so that the rest of the boys will know whom to blame.

6. Since tool foremen have other duties at the *opening* and *closing* of shop period do not ask them to issue tools at either time.

During a six months' check period the following tools were loaned. The number after the name of the tool indicates the frequency borrowed:

Backsaw (6)	Coping saw (18)
Surface plane (9)	Screw driver (1)
Cold chisel (1)	Block plane (5)
Auger bit and brace (7)	Wood chisel (2)
Portable vise (10)	Turning saw (1)
Hand drill (12)	Putty knife (1)

Total — 73

INDUSTRIAL ARTS
LOAN SLIP

No tools, materials, or reference aids may be taken from this room unless the following information is filled out and agreement lived up to.

Date_____

I, _____, desire to borrow_____

and return same to shop on_____

in good condition. In event of damage or loss I will be personally responsible and pay for the same.

Signed_____ Room No._____

Fig. 2. Loan slip — 3 x 5 in.

There were 59 participants, some of whom borrowed more than one tool at a time. Total shop registration during this time was 212 boys.

There were a few requests for tools not posted on the loan panel. These requests were handled by the instructor on an overnight loan basis.

During three years of the tool library no tools were lost at all. There were five cases of overdue loans but social pressure (see regulation No. 5) quickly corrected these.

The most enthusiasm for the tool loan idea was shown by the sixth graders who have but one double period per week of industrial-arts work.

It is of the utmost importance that the tools be well sharpened and in first-class condition since they *advertise* the school shop to the parents and serve to stimulate the purchase of quality tools for home use.

About one third of all fatal accidental shootings occur in connection with hunting trips.

A SYSTEMATIC METHOD OF TEACHING DIMENSIONING

GEO. W. HAAS

Glenbard Township High School

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Commercial draftsmen and engineers generally agree that the choosing and placing of dimensions is a most important item in the making of a mechanical drawing; yet this part of drafting is often most poorly and least thoroughly taught.

Most textbooks designed for high school use do not give much help in teaching dimensioning, for while some of them may give sound principles to follow, practically none of them provide an integrated and soundly developed section that will teach a student to dimension intelligently and systematically. In the average textbook and article on drawing, samples such as Figure 1 are the rule rather than the exception.

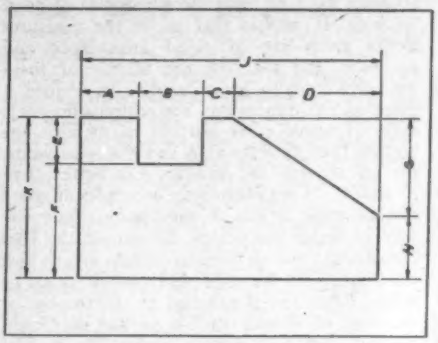


Fig. 1

While this may be satisfactory for some purposes, it is far from adequate either for

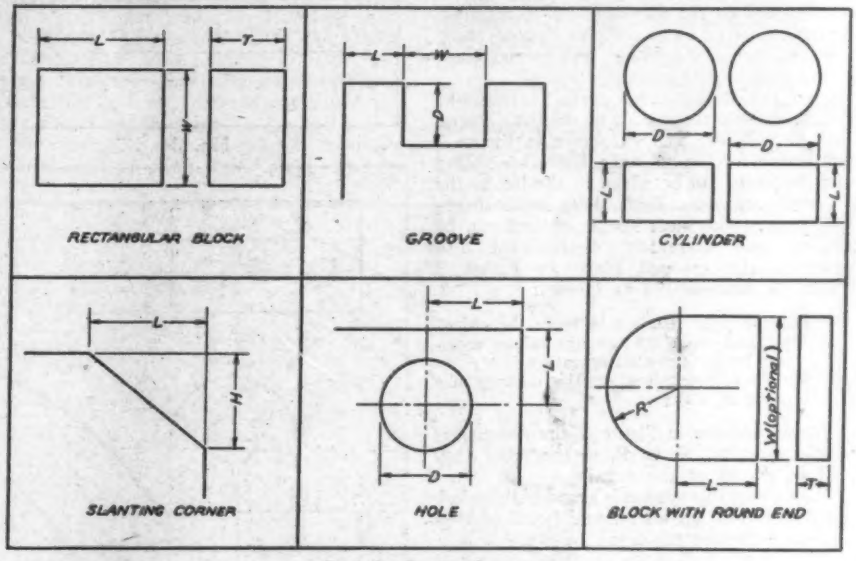


Fig. 2. Basic shapes

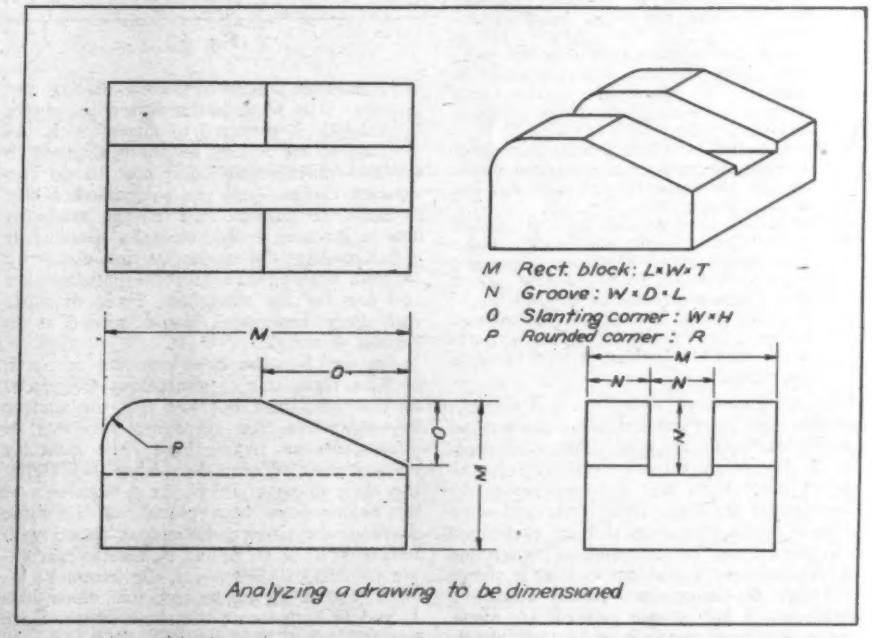


Fig. 3

accurate work or from the standpoint of good teaching. It implies that all of the measurements given are of equal importance and accuracy, and that the use of any of them will give equally good results. In Figure 1 three of the dimensions are entirely unnecessary. If some other part is to fit into the groove, then dimensions *B* and *F* are necessary for an accurate fit and are far better than *F* and *C*. A fundamental principle of good dimensioning is that it must permit only one way to make the object. To choose the best dimension, the draftsman must know how the part is to be used and how it is to be made. From the standpoint of the teacher of drawing, we should teach a method of dimensioning that will always make the student conscious that he is telling someone how to make something.

Over a period of several years we have developed in our drawing classes a system of dimensiong that can be grasped by a beginning drawing student, but which applies equally well to the dimensioning of a simple broom holder or to a complex casting which involves coring, machining, and special operations such as tapping and grinding.

First the student must learn to recognize and understand the making of the basic shapes that he will use. The six shown in Figure 2 will suffice for the beginner, but other shapes and processes can be added to the list as the student progresses. With these basic shapes well understood, most simple objects can be quickly and accurately dimensioned. For example, the grooved block in Figure 3 would be dimensioned as follows:

1. List the steps required to make the object.
2. After each step list the dimensions necessary to perform that operation.
3. Place the dimensions on the drawing one group at a time.

In the drawing in Figure 3, the dimensions are lettered M, N, O, P, in the order they will be placed on the drawing.

We believe this system is sound both technically and from an educational point of view for the following reasons:

1. It keeps the student continually conscious of the fact that he is telling someone how to make the object being dimensioned.
2. It compels the student to analyze the problem and to do some logical thinking in choosing his dimensions, rather than attempt to follow blindly a few arbitrary and vague rules.
3. When applied to objects such as castings or forgings, it requires the student to go through the necessary steps mentally, and in their proper order.
4. The ability to dimension by this method is limited only by the student's knowledge and recognition of additional shapes and processes. While it is generally agreed that dimensions *should be* done by breaking the object down into simpler components, this method provides a systematic way of learning how to analyze an object.

The dimensioning of castings and forgings presents some new problems, but the method just described will still apply. Before attempting to dimension any of these objects the student must learn how patterns are made, how castings are made from them, and some of the machine operations that are performed upon the casting. For example, in preparation for dimensioning a problem such as is shown in Figure 6, the student should acquire a knowledge of how simple patterns are made, how a casting is made in sand, and should

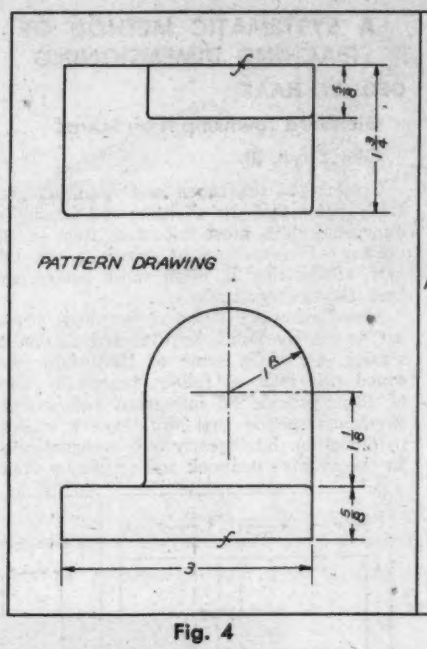


Fig. 4

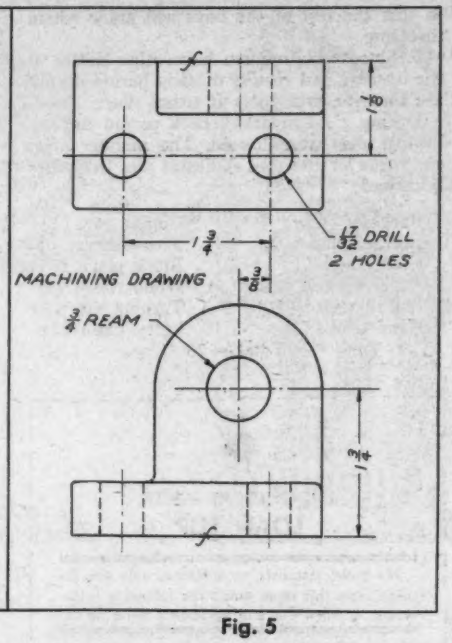


Fig. 5

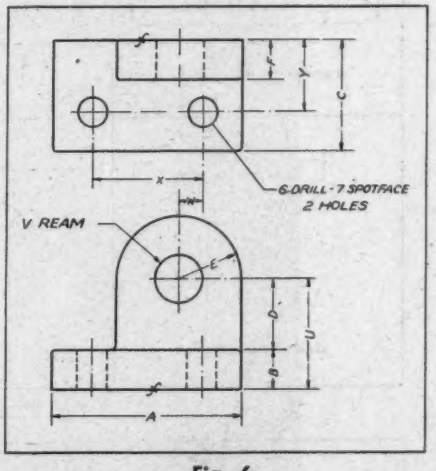


Fig. 6

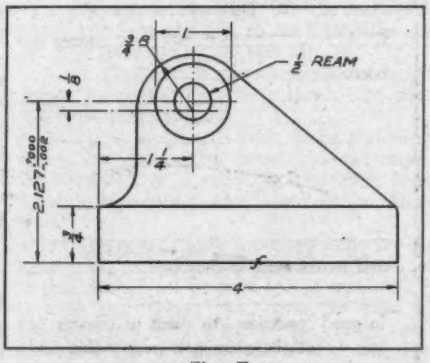


Fig. 7

understand the process of planing, drilling, and reaming. After he understands how the object is made, he is prepared to dimension it. As the student will readily see, he is required to tell two different workmen how to do two separate things — tell the patternmaker how to make the pattern, and tell the machinist how to machine it. Educationally speaking, it is best to have the student at first make two *separate* drawings, one for the patternmaker and one for the machinist. These drawings with their dimensions would appear as in Figures 4 and 5.

For any but the most complex of parts, both of these sets of dimensions are placed on the same drawing. Now that the student is well aware that there *are* two sets of dimensions, he should have little difficulty distinguishing between them when they are on the same drawing. In Figure 6 both sets of dimensions have been placed on the same drawing, the pattern dimensions shown with letters A, B, C, D, E, and F, and the machining dimensions shown with the letters V, W, X, Y, and Z. It will be seen that dimensions U and D both locate the same center. Since one principle of good dimensioning is that each part shall be dimensioned in only one way, one of the figures will have to be eliminated. Since dimension U locates the center more accurately than D, the latter should be dropped. It is true that the patternmaker will use dimension D, but he is accustomed to calculating and can easily get the figure he needs. For the machinist, every figure that he will use must be shown on the drawing. This possibility of double dimensioning must always be considered in dimensioning castings or forgings.

It should go without saying that the dimensions for the pattern should be chosen first and those for the machining operations afterward. Such frequently is not the case, however, even in commercial drafting rooms, and the result is an absurdity such as is shown in Figure 7, in which the center of the pattern is located from a center that will not be established until the casting is machined. While it is true that the patternmaker must be able to calculate accurately, there is no purpose in forcing him to make calculations when the needed information could be given with the same number of dimensions if they were properly chosen. A well-dimensioned drawing will show every measurement that needs to be used, and no others.

In using this material in teaching dimensioning, we have found that our students quickly understand the idea that dimension-

ing requires a knowledge of how to make the object in question. We have also found that the students have a much more intelligent and accurate notion of what good dimensioning requires.

ALUMINUM CAKE SERVER

OLIVER P. EITZEN

Washington Junior High School

Bakersfield, Calif.

This cake server is a project in art metal and wood, and has proved very popular and successful in the junior high school shop.

The metal part is made of scrap aluminum alloy, approximately 1/32 in. thick, which may be obtained from aircraft manufacturers. If other metals are used, oxidation and reaction with food should be considered.

The piercing is accomplished with a drill, jeweler's frame saw, and needle files.

The handle is made of hardwood, and is cut to shape with a jig saw or a band saw. Walnut or maple are very suitable. Applications of wood filler and lacquer make a good finish.

The handle should fit the metal part tightly. A flat head, 1/2 by No. 3, wood screw completes the assembling.

The several factors which make this cake server a successful project include: the varied tool processes involving woodworking and metalworking, the inexpensive and small amount of material required, and above all, the student will be overjoyed with its value as a gift.

OSCILLATING SPINDLE SANDER

WILLIAM A. DEVETTE

Muskegon Junior College

Muskegon, Mich.

The sander with an oscillating spindle shown in the accompanying illustration was designed by John F. Faber, a former drafting instructor at the Technical High School, Erie, Pa. It was detailed by the students in his classes, and then built by the classes in patternmaking and machine-shop practice. The completed machine was placed in the pattern shop where it has proved an invaluable asset.

It is now being passed on to the readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION in a form which it is hoped will again benefit the drafting, patternmaking, and machine-shop practice classes.

The oscillating spindle sander is composed of a number of parts which make excellent drawing problems as well as shop projects. Therefore, the assembly and detail drawings are presented in pictorial form.

The students in the drafting classes may then use these pictorial drawings in preparing the detail drawings for the shops. The first check may be made by having an advanced student make a working assembly from these working drawings. The final check must, of course, be made by the instructor.

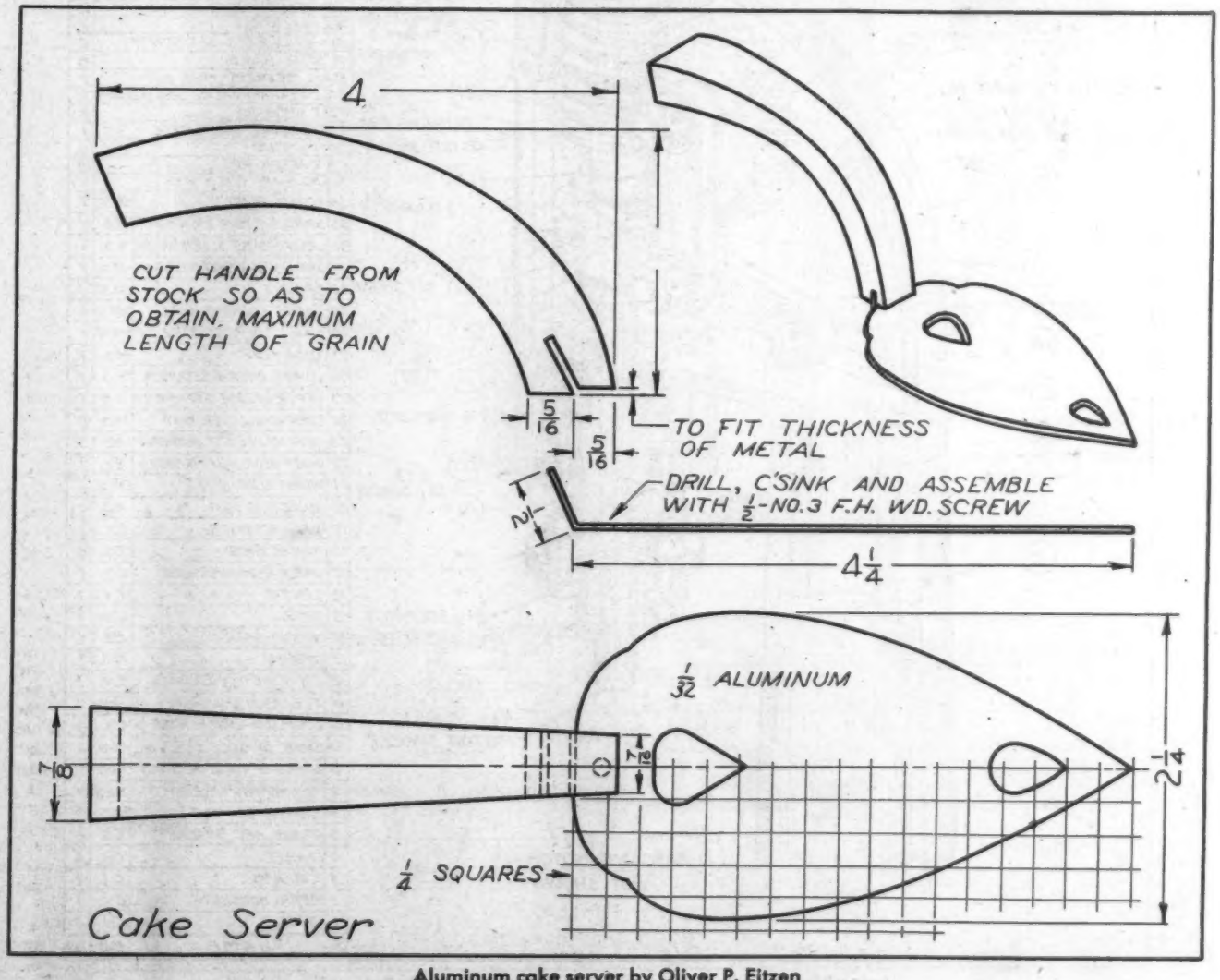
A procedure which has been found very advantageous is to furnish the pattern and machine shops with a set of "master" prints on which the respective instructors may note changes or corrections to be incorporated in the tracings.

Some slight changes may be expected due to the probable unavailability of ball bearings called for in the assembly. In this case, others, with possibly different dimensions, may have to be substituted and details changed accordingly.

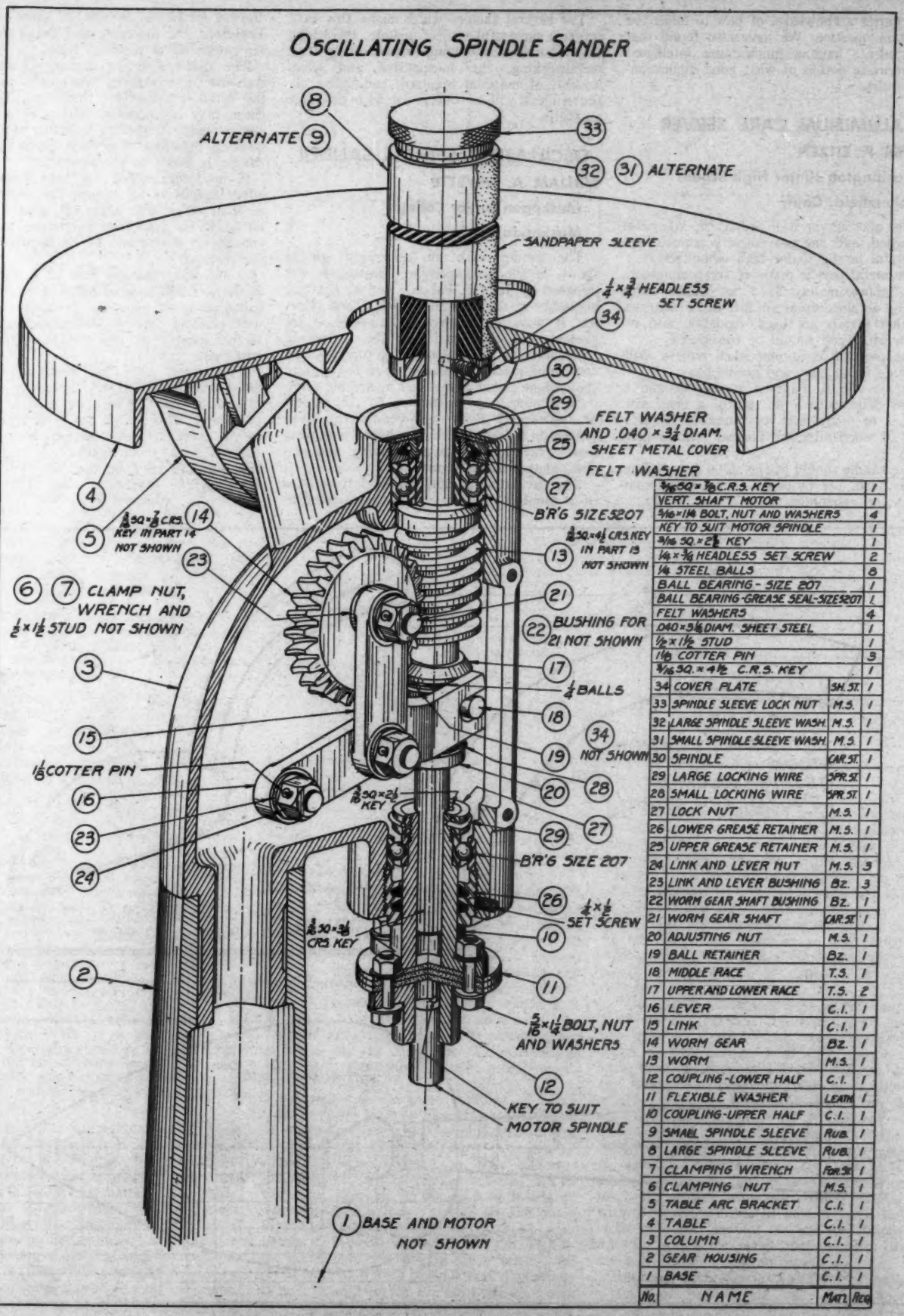
The cover plate has been intentionally omitted as its design will depend on the type of switch box that will be used to operate the motor. This switch box is to be mounted on the cover plate over the gear housing.

Even if only one machine is to be built, the drawings may be used as problem material in the drafting classes. There is, of

(Continued on page 459)

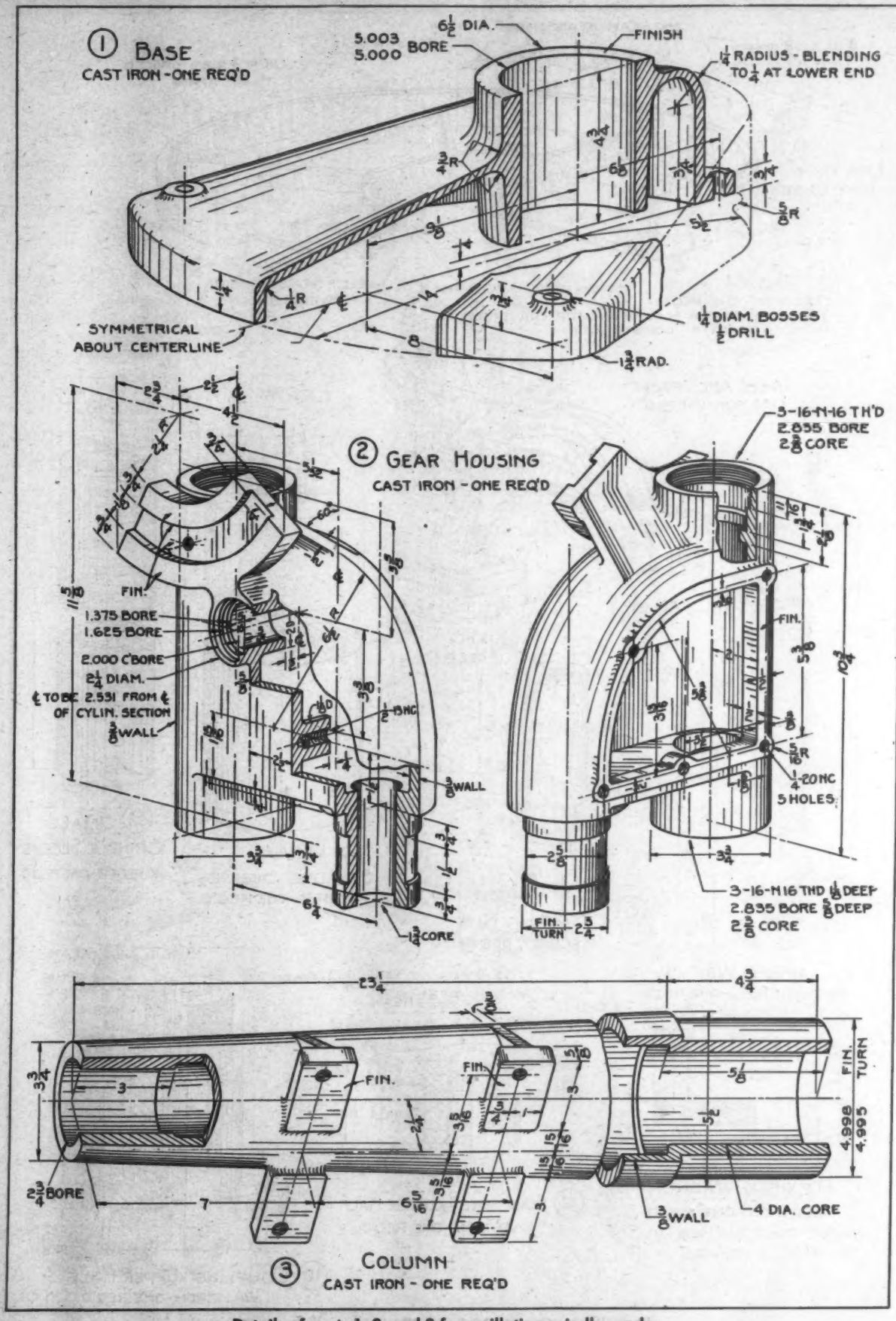


Aluminum cake server by Oliver P. Eitzen

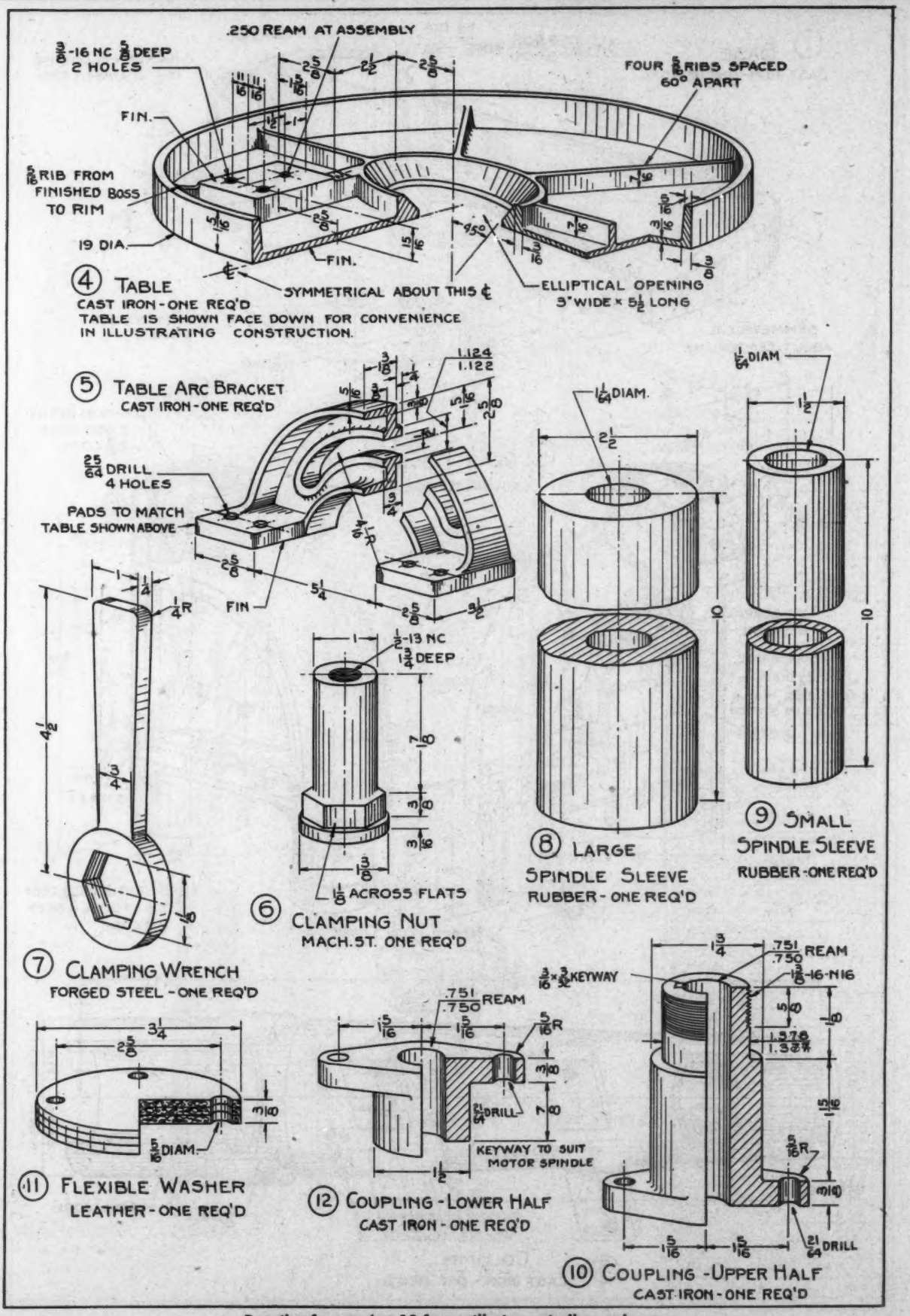

OSCILLATING SPINDLE SANDER
ALTERNATE
SANDPAPER SLEEVE
1/4 x 3/4 HEADLESS SET SCREW
FELT WASHER AND .040 x 3 1/4 DIAM. SHEET METAL COVER
FELT WASHER
B'R'G SIZE 207
CLAMP NUT, WRENCH AND 1/2 x 1 1/2 STUD NOT SHOWN
BUSHING FOR 21 NOT SHOWN
1/4 BALLS
1/8 COTTER PIN
KEY TO SUIT MOTOR SPINDLE
5/16 x 1 1/4 BOLT, NUT AND WASHERS
BASE AND MOTOR NOT SHOWN

No.	NAME	MAT'L.	REQ.
	3/16 SQ. x 1/2 C.R.S. KEY		1
	VERT. SHAFT MOTOR		1
	5/16 x 1 1/4 BOLT, NUT AND WASHERS		4
	KEY TO SUIT MOTOR SPINDLE		1
	3/16 SQ. x 2 1/2 KEY		1
	1/4 x 3/4 HEADLESS SET SCREW		2
	1/4 STEEL BALLS		8
	BALL BEARING - SIZE 207		1
	BALL BEARING-GREASE SEAL-SIZE 207		1
	FELT WASHERS		4
	.040 x 3 1/16 DIAM. SHEET STEEL		1
	1/2 x 1 1/2 STUD		1
	1/8 COTTER PIN		3
	3/16 SQ. x 4 1/2 C.R.S. KEY		1
34	COVER PLATE	SH. ST.	1
33	SPINDLE SLEEVE LOCK NUT	M.S.	1
32	LARGE SPINDLE SLEEVE WASH.	M.S.	1
31	SMALL SPINDLE SLEEVE WASH.	M.S.	1
30	SPINDLE	CAR. ST.	1
29	LARGE LOCKING WIRE	SPR. ST.	1
28	SMALL LOCKING WIRE	SPR. ST.	1
27	LOCK NUT	M.S.	1
26	LOWER GREASE RETAINER	M.S.	1
25	UPPER GREASE RETAINER	M.S.	1
24	LINK AND LEVER NUT	M.S.	3
23	LINK AND LEVER BUSHING	Bz.	3
22	WORM GEAR SHAFT BUSHING	Bz.	1
21	WORM GEAR SHAFT	CAR. ST.	1
20	ADJUSTING NUT	M.S.	1
19	BALL RETAINER	Bz.	1
18	MIDDLE RACE	T.S.	1
17	UPPER AND LOWER RACE	T.S.	2
16	LEVER	C.I.	1
15	LINK	C.I.	1
14	WORM GEAR	Bz.	1
13	WORM	M.S.	1
12	COUPLING - LOWER HALF	C.I.	1
11	FLEXIBLE WASHER	LEATH.	1
10	COUPLING - UPPER HALF	C.I.	1
9	SMALL SPINDLE SLEEVE	RUB.	1
8	LARGE SPINDLE SLEEVE	RUB.	1
7	CLAMPING WRENCH	FOR. ST.	1
6	CLAMPING NUT	M.S.	1
5	TABLE ARC BRACKET	C.I.	1
4	TABLE	C.I.	1
3	COLUMN	C.I.	1
2	GEAR HOUSING	C.I.	1
1	BASE	C.I.	1

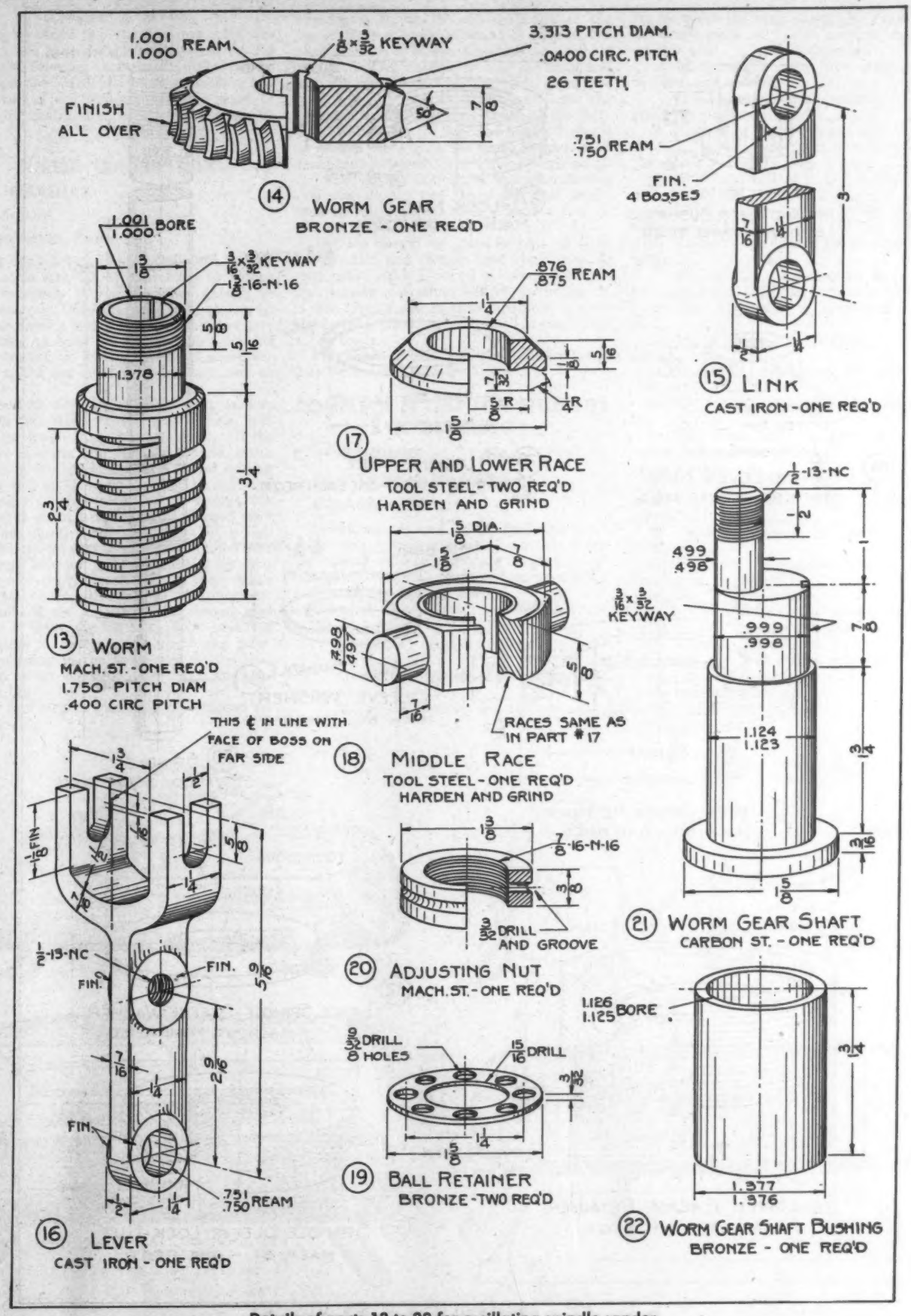
Assembly of oscillating spindle sander by William A. DeVette



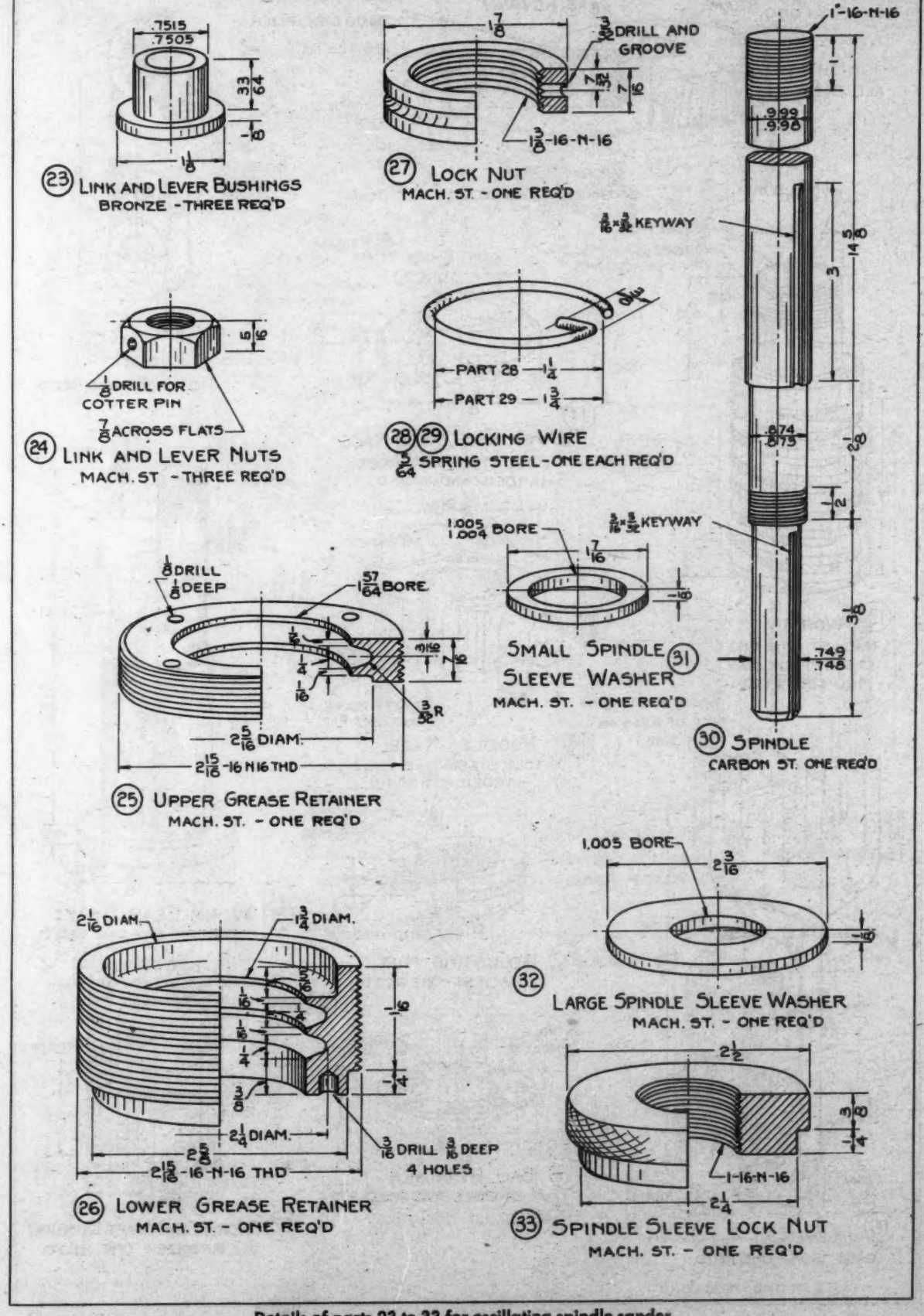
Details of parts 1, 2, and 3 for oscillating spindle sander



Details of parts 4 to 12 for oscillating spindle sander



Details of parts 13 to 22 for oscillating spindle sander



Details of parts 23 to 33 for oscillating spindle sander

(Continued from page 453)

course, no doubt that the drawings for a live project will have the greatest interest for the students. Knowing that the drawings will be used for the construction of a machine will serve to put the students on their guard to make the drawings as perfect as they can be made.

TURTLE TRINKET BOX

D. C. MARSHALL

High School

Manhattan, Kans.

You don't have to be a taxidermist to preserve some trophies of your hikes or fishing trips, especially if you are lucky enough to get a snapper. Once you have him, he can be made to serve a useful purpose instead of just something to hang on the wall. A turtle on a log trinket or jewelry box is a novel addition to the den or camp and it isn't hard to make.

A medium size turtle will be most suitable for this job. After he has quit kicking, just cut him loose from his top shell. If the weather is warm and flies are around, cover the inside of the shell with a liberal coating of salt and set it away to dry. The log may be a piece of tree trunk just as mother nature made it, or a thick piece of wood may be turned down on the lathe. Saw off a slab to make the lid and then hollow out the box. This may be done with a brace and bit or a mallet and chisel but it can be done much faster and easier with a hollow chisel mortiser. The ends of the log are sanded smooth and then it is ready for the legs. Short pieces of tree limbs or branches are glued into holes bored slanting in the lower side of the box. Another short piece is used for a knob to lift the lid.

The first step in mounting the snapper on the log is to whittle out the body of the turtle. Take a block of wood as wide as the shell and cut it to the shape of the shell. It should be long enough so that the head and tail will project beyond the shell. After the head and tail have been finished, shape the rest of the block to fit the inside of the shell. Then whittle out the legs and feet and attach as shown in Figure 1. Small, round head tacks may be used for the eyes. Next, polish the shell with a stiff brush and after having removed all dirt and dingy film that might hide the color in the shell, give it a coat or two of clear lacquer.

The log should be given a coat of light brown stain and then a light application of gray paint which is wiped off while it is still wet, leaving a weathered effect on the log. It is then given a coat of clear lacquer to protect the surface. Then fasten the shell in place with a few brads.

The inside of the box may be lined or it may be finished with lacquer.

COMPLETION TEST FOR STUDENTS OF DRAFTING

C. H. SCHUBERT

Boys' Technical High School

Milwaukee, Wis.

Directions: In each of the following statements one or two words are omitted. When the correct word or words are inserted in the blanks left for them, the sentences are specific and complete. Do not guess.

Example: The ohm is the unit of resistance.

1. Mechanical drawing is the ..... of industry.
2. Mechanical drawing does develop the power of .....
3. Mechanical drawing is a form of drawing by which the exact shape, size, finish, etc., of every piece of some machine may be quickly and ..... described.
4. Mechanical drawing is an exact science of form and of size .....
5. It is necessary for a mechanic to understand the fundamentals of ....
6. A drawing board is made of .....
7. ..... are fitted into the ends of the drawing board to keep it from .....
8. The left end of the drawing board must be perfectly .....
9. The working surface of the drawing board should be ..... and free of holes.
10. The left-hand edge of the drawing board is the ....
11. The ..... derives its name from its shape which is in the form of a "T."
12. The T square is frequently made of .....
13. The T square is made up of ..... parts.
14. The long thin strip is called the .....
15. The short thick part is known as the .....
16. The blade and the head of the T square are fastened at .... to each other.
17. The upper edge of the blade and the inside edge of the head of the T square are called the ....
18. The upper edge of the blade must be absolutely .....
19. The inner edge of the head of the T square must be perfectly .....
20. The T square with a ..... edged blade is used by draftsmen because they can see their work through the edge.
21. T squares are made in varying ....., the length used will depend upon the length of the drawing board.
22. The T square should ..... be used as a hammer.

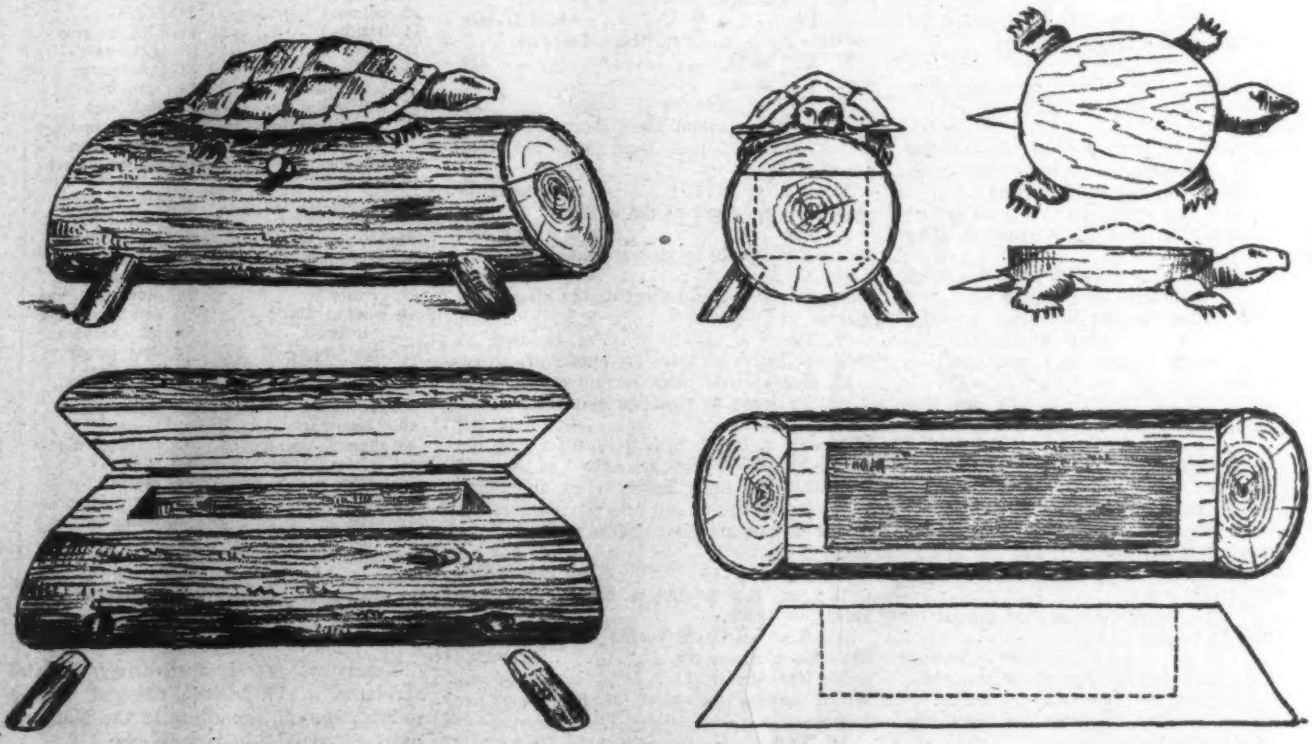


Fig. 1. Turtle trinket box

23. The head of the T square is held firmly against the left edge of the drawing board in order to draw ....

24. Drawing pencils are made ..... in shape to prevent them from rolling off the drawing table.

25. .... are drawn along the upper edge of the T-square blade.

26. Two triangles are always used in ....

27. The ..... derive their name from their shape — three angles.

28. Triangles made of ..... are most commonly used in drafting.

29. The two triangles most commonly used in drawing are the ..... and the ..... triangles.

30. The sum of the angles of either triangle used in drafting is ..... degrees.

31. There are ..... degrees in a right angle.

32. An acute angle is ..... than a right angle.

33. An obtuse angle is ..... than a right angle.

34. Either triangle may be used to draw a ..... line.

35. A right triangle is a triangle having one ....

36. An isosceles triangle is a triangle having .... angles.

37. An equilateral triangle is a triangle having .... angles.

38. A ..... is used for measuring or setting off angles other than those obtainable with the regular triangles used in drawing.

39. ..... are generally used for holding paper to the drawing board.

40. The head of the ..... should be ..... to allow the T square and triangles to slide easily over them.

41. The .... is used to protect lines adjacent to the area to be erased.

42. A ..... properly sharpened is necessary for good work in mechanical drawing.

43. A ..... pencil is usually used for drawing lines in mechanical drawing.

44. A ..... pencil is used to accentuate all lines on the finished pencil drawing.

45. For lettering and dimensioning a .... pencil is used.

46. The ..... end of the drawing pencil is sharpened to preserve the grade mark on the other end of the pencil.

47. A long ..... point is preferred on the drawing pencil for all ordinary drafting work.

48. A long conical point is used to lay off ..... accurately on the drawing.

49. For ruling straight line work a wedge point or ..... point is preferred, because it wears longer and requires less sharpening.

50. A .... is a line that is parallel to the horizon.

51. .... are ruled from left to right along the upper edge of the T-square blade.

52. The location points for .... are marked off along the left edge of the drawing paper.

53. A line drawn at right angles to the horizontal line is a ....

54. Either triangle may be used against the T square to draw ....

55. .... are drawn upward along the left vertical edge of the triangle.

56. The location point for .... are marked off along the lower edge of the drawing paper.

57. The .... is used for drawing curved lines other than circles and arcs.

58. The 12-in. ..... scale is commonly used as a measuring device in mechanical drawing.

59. The architect's scale is made of boxwood and is ..... in shape, the ends being equilateral triangles.

60. When an object is too large to fit the drawing paper, it is drawn at a ..... scale.

61. The next smaller scale to full size is .... or 6 in. equals 1 ft.

62. The next smaller scale to half size is ..... or 3 in. equals 1 ft.

63. A line 4¼ in. long drawn at half size will be ..... long when drawn at full size.

64. The most important part of a drawing, as far as appearance is concerned, is the .....

65. The ability to letter well can be acquired through continued and diligent .....

66. .... are a necessary aid to good lettering and should be drawn very lightly.

67. All letters and numerals are made .....

68. A ruling pen is :..... used for lettering.

69. The bar dividing a fraction should be ..... to the bottom of the dimension.

70. The total height of the fraction is ..... the height of the whole number.

71. Inclined letters are usually made at an angle of ..... degrees with the horizontal.

72. Capital letters are known as .... letters.

73. Letters other than capital letters are known as .... letters.

74. Letters in the title are usually made ..... of an inch in height.

75. Smaller capital letters such as in notes and other data are usually made ..... of an inch in height.

76. The .... which frames the drawing is an extra heavy full line.

77. All visible .... are heavy full lines.

78. The invisible or .... is a medium line composed of short dashes about ⅛ inch long, with 1/32-inch spaces.

79. The .... is used to show invisible edges of the object.

80. The .... is a light full line spaced evenly to give a shaded effect.

81. A .... is a broken line, composed of long and short dashes alternately spaced.

82. The .... is used to indicate centers of holes or centers of circles.

83. Every circle must have two .... drawn at right angles to each other.

84. The .... is a light full line with a break near its center for the dimension. Arrowheads are affixed at the ends to indicate the exact length of the dimension.

85. Pencil circles and arcs having a radius of one inch or more are drawn with ....

86. The .... is used to ink circles or arcs having a diameter of two inches or more.

87. A pencil circle having a radius of less than one inch, use the ....

88. Use the .... to ink circles having diameters of less than two inches.

89. The ..... are used to transfer measurements and to divide a line into equal parts.

90. All straight lines are inked with the ....

91. The shouldered needle point of the compass should be adjusted so that it is a little ..... than the pencil point or the pen attachment, if the latter is used.

92. It is important when inking large circles that the legs of the compass are nearly ..... to the drawing.

93. A ..... is a curved line, every point on the circumference being equidistant from a given point within called the center.

94. The ..... of a circle is the distance from the center to the circumference.

95. The distance around a circle is the .....

96. The ..... of a circle is a straight line passing through its center from side to side.

97. A straight line that touches a circle in one point only is a .....

98. There are ..... degrees in a circle.

99. An octagon has ..... sides.

100. A five-sided polygon is called a .....

Answers To Completion Exercise

1. language
2. visualization
3. accurately
4. description
5. mechanical drawing
6. softwood
7. Cleats, warping
8. straight
9. smooth
10. working edge
11. T square
12. hardwood
13. two
14. blade
15. head
16. right angles
17. working edges
18. straight
19. straight
20. celluloid
21. lengths
22. never
23. horizontal lines
24. hexagonal
25. Horizontal lines
26. mechanical drawing
27. triangles
28. celluloid
29. 45 degree 30-60 degree
30. 180 degrees
31. 90 degrees
32. less
33. greater
34. vertical also inclined
35. right angle
36. two equal
37. three equal
38. protractor
39. Thumbtacks
40. thumbtacks, flat
41. erasing shield
42. pencil
43. 4H
44. 2H
45. 2H
46. unlettered
47. conical
48. distances
49. chisel
50. horizontal line
51. Horizontal lines
52. horizontal lines
53. vertical line
54. vertical lines
55. vertical lines
56. vertical lines
57. irregular curve
58. architect's
59. triangular
60. reduced
61. half size
62. quarter size
63. 8½"
64. lettering
65. practice
66. Guide lines
67. freehand
68. never
69. parallel
70. 1 2/3
71. 67½ degrees
72. upper-case
73. lower-case
74. 3/16 inch
75. ⅛th inch
76. border line
77. object lines
78. hidden object lines
79. dotted lines
80. section line
81. center line
82. center line
83. center lines
84. dimension line
85. pencil compass
86. ink compass
87. bow pencil
88. bow pen
89. dividers
90. ruling pen
91. longer
92. perpendicular
93. circle
94. radius
95. circumference
96. diameter
97. tangent
98. 360 degrees
99. 8
100. pentagon

Nearly one fourth of all drivers in fatal accidents in 1944 were charged with a speed violation, according to the National Safety Council. — *Safety News.*

THE SCRAP-SOLDER BOX

CHARLES H. SCHEINER

Montauk Junior High School

Brooklyn, N. Y.

The training for good citizenship, a very important cardinal principle of education, should be one of the main aims of the shop teacher. We can do much to inculcate this principle in our shopwork. One way of doing this is to foster economy wherever possible, and the scrap-solder box fastened to the top of the soldering bench is one way to do this.

The students seem to enjoy dropping into the box many tiny scrap pieces of solder that ordinarily would be brushed into the waste

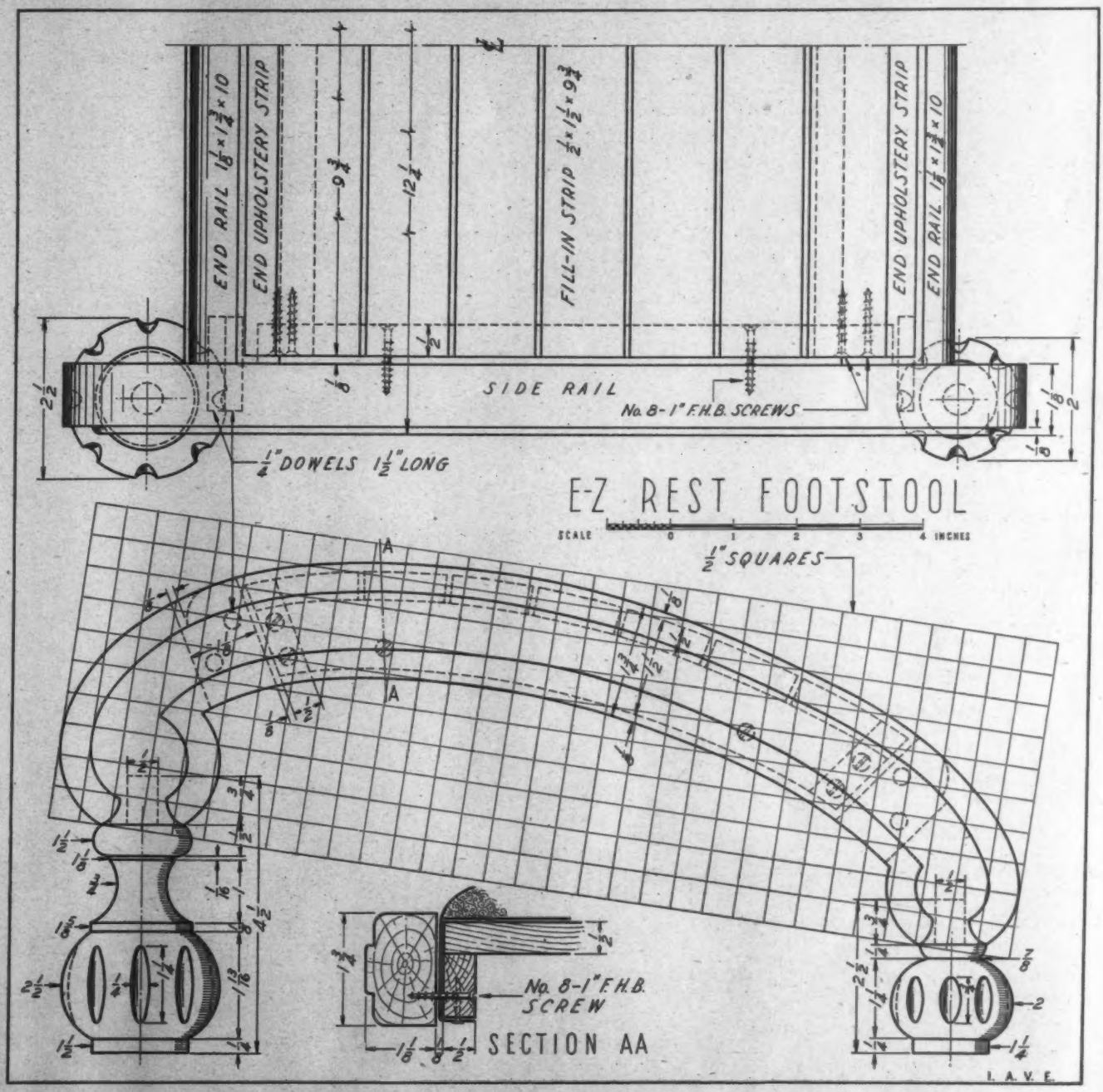
can. I have seen some pupils pick up pieces that may have fallen on the floor. At the end of each term, the tiny scrap pieces are recovered from the box and put into a melting pot. Strip solder is then made from these tiny pieces. When the pupils realize the saving involved, it is easier for them to carry over this idea of thrift to many other civic obligations.

TOY WAGON WITH BUILDING BLOCKS

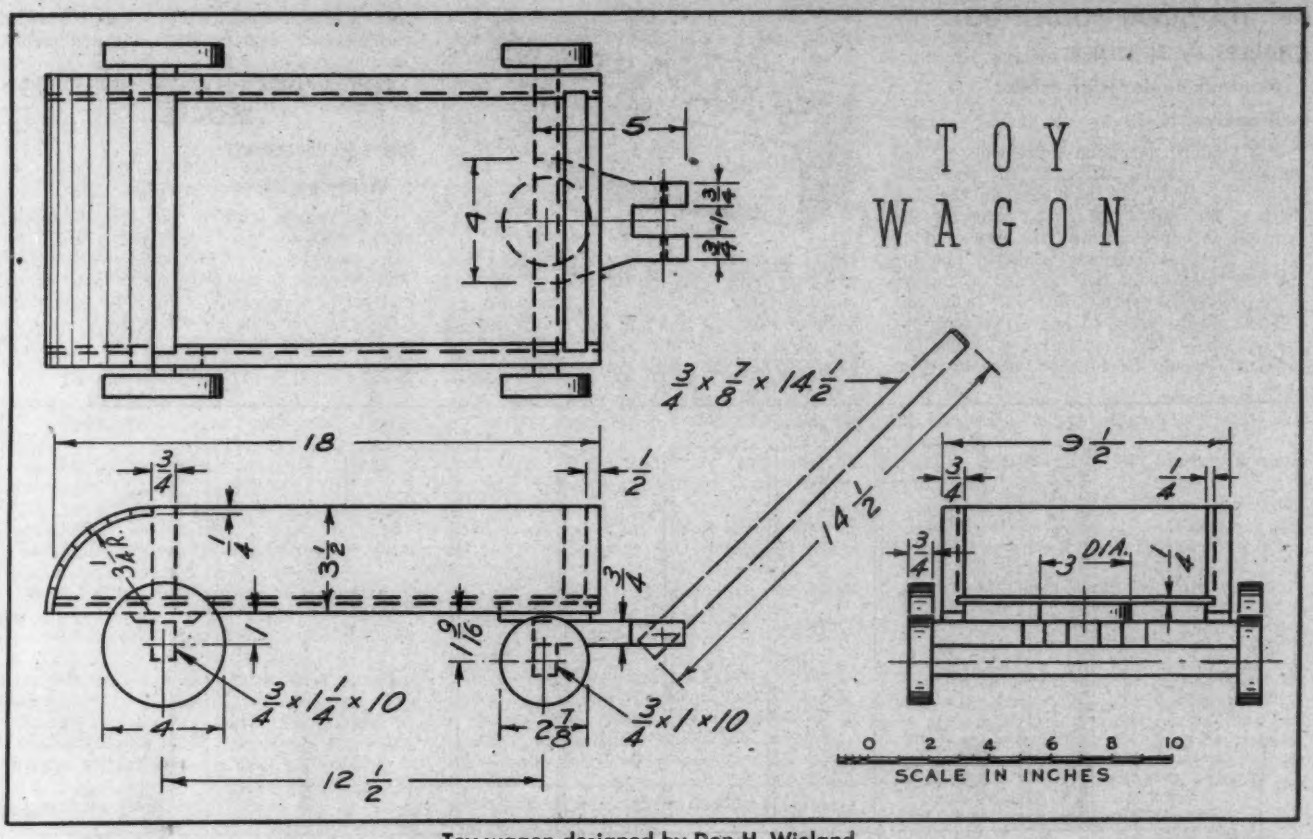
DON H. WIELAND

Waterloo, Iowa

A toy wagon with the box full of building blocks makes a good Christmas project, besides providing a use for small wood scraps. The drawing is self-explanatory. The curved end of the wagon box is made by gluing and nailing narrow strips in place and sanding off the rough corners. The wagon may be painted in one or more bright colors.



E-Z rest footstool designed by A. F. Starkey, High School, South Milwaukee, Wis.



Toy wagon designed by Don H. Wieland

The set of building blocks may be made of the following sizes: 6 blocks — ¾ by 2 by 6 in., 20 — ¾ by 2 by 3 in., 10 — ¾ by ¾ by 6 in., 10 — ¾ by ¾ by 3 in., 10 — ¾ by ¾ by 1½ in., 10 — ¾ by 3 by 3 in.

WRITTEN MATTER TRANSMITTED

The transmission of all types of written as well as printed material by wire and radio in the process known as facsimile was perfected during the war. Through its use the recipient of the message although he may be miles away, receives an exact copy of the original. This form of service will decrease the time required for transmitting photostats which is now done by mail or courier. Business houses, the press, and possibly government agencies are interested in this type of service.

Many other developments in communication are in store for us but since these are not yet ready for public use discussion is held to those things which are now or soon will be a part of our daily living.

TELEVISION IS HERE!

Great strides have been made in perfecting television which may soon become a household requirement. Many obstacles have already been hurdled and many more will soon be overcome. The most widely publicized report of its success was on the occasion of the Louis-Conn heavyweight battle. An indication of its future is the number of applications pending in the Federal Communication Commission for frequency allotments.

There are 6 television stations in operation in this country; 25 more are under construction. Applications for an additional 50 have already been filed in the U. S. Federal Communications Commission, and at least 50 more applications are in process of being prepared. These stations will be located in the large metropolitan cities.

Contributing to television, which as yet does not have a long range of receptivity and has usually required studio performances, is the coaxial cable now being perfected. This consists of a single copper-core cable which permits multifrequency channels to operate over it simultaneously, thus providing the means of transmitting the numerous frequencies required. The coaxial cable also provides facilities whereby many individual messages, either telegraph or telephone or both, can be transmitted simultaneously.

The television receiving set now being used has a small screen, but the trend is toward larger images as the accompanying illustration of a receiver soon to be in production indicates. At present the transmitted image is black and white but sooner or later the scene of action will be presented in its true colors.

BUTTONS SUITABLE FOR BACKGROUND STAMPS

SIMON S. PALESTRANT
Bronx, New York City

The leatherworker is ever in search for new designs for making border and background stamps. A ready source for such stamps is the supply of decorative, plain,

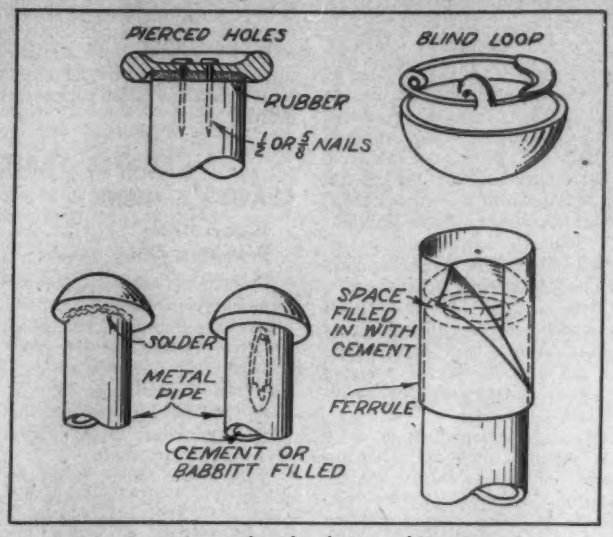
Transforming buttons into leather stamps

dress, suit, or coat buttons. While some plastic, glass, wood, or ceramic buttons may be used, by far the best type of buttons for this purpose are the metal ones.

To convert a button into a background stamp, take a piece of dowel rod 3 or 4 in. long, and of a diameter equal to or slightly larger than that of the button itself. Should the button have pierced holes for sewing then two well-placed ½- or ⅝-in. nails will anchor them directly to the dowel. A small piece of ⅛-in. rubber pad can act as a shock absorber. If the button has a blind loop for sewing purposes, then fit a small safety pin through the loop of the button to act as an anchor. Affix this pin to the end of the dowel with a double pointed nail and then bed down the area between the button and dowel with some Keene Cement. Since this cement is worked like plaster it is wise to wall the edges with a wax paper or a metal ferrule until the cement sets.

Another method to set a handle on the button is to use a short end of water pipe or a piece of electrical conduit. Set the button on the end as you would a plug and while holding it in place fill the pipe with cement from the other end. The safety pin should have been attached to the back of the button previously to make a firmer anchor. Allow the cement to harden and the stamp is finished. The metal buttons may also be soldered to the pipe, or the latter may be filled with babbitt metal.

The dowel stick should be used as a presser while the pipe tube can be employed as a punch. Shallow markings on the buttons make for better stamps than those with high relief. If the button is hollow it is wise to drill two small holes through the back and reinforce it by filling it with molten lead. Since some buttons are slightly rounded on the face they should be maneuvered with a slightly rocking motion when used as stamps so that the entire design can be recorded.



Buttons used as background stamps

COACH HITS "BULL'S-EYE" WITH ARCHERY

C. R. GAYLORD
South Milwaukee, Wis.

"Toxophilite" sounds like a new disease, but Webster says it is "one fond of, or devoted to archery." Roger Ascham published a book about it in England in 1571; and centuries before that "Ishmael dwelt in the wilderness of Paran and became an archer."

When Coach F. Rogers Constance introduced archery to the students of the Montello (Wis.) high school in September, 1945, he presented it merely as a hobby — an extra-curricular activity; he wanted to make a contribution to the general good health, posture, and pastime of the youngsters in this small, picturesque Marquette county city.

But he scored a bull's-eye with it! The lads and lassies took to it with zest and alacrity; and even the teacher of agriculture, Jack Whirry, became an enthusiast and won himself membership in the club's "bull's-eye" and "30" clubs in one end by scoring 31 points with six consecutive arrows, including one "bull's-eye."

Freewill participation encouraged this project at the beginning, but now it is fully adopted and is formally taught by both coach and monitors at regular, assigned periods. Tally of each member's shooting is recorded on official score cards. A 20-yard shooting distance is maintained and three periods each week are given to this sport.

In the winter months the clubs move indoors to the spacious gym. Bales of marsh hay are wrapped and sewed up in burlap for a target background. Paper mats protect the floor under the target and the wall.

Visitors are permitted to attend and watch the shooting. Grade youngsters are interested spectators and are thereby converted into future candidates for club membership.

Coach Constance is convinced that this sport of archery teaches good posture, correct breathing, and development of eye focus. Shooting accuracy is the objective but there are by-products of high value. The project makes a real contribution to good health and pastime enjoyment. Safety is emphasized. Each archer is his own retriever for safety sake. More than 30 boys and girls are participating in this sport, beside some of the faculty. The boys have proved more skillful, but not more enthusiastic, than the girls. Several of the archers own their own bows.

Ascham's book specified the long bow in either flat or hunting style. Women's bows pull about 20–25 pounds, and are 5½ ft. long. Men's bows are usually 6 ft. long, and pull 40–50 pounds. Good bows can be made from hickory or lemonwood, but the best bows are made of yew or Osage orange. Target arrows are made of birch or cedar in either plain or footed style and are usually 26 or 28 in. long.

As yet, none of Coach Constance's archers have made their own arrows or bows. Repairs to arrows are made by the students, such as attaching any necessary nocks, feathers, and points. Repaired arrows which become shorter than 26 inches are not considered good for safe shooting and are therefore, disposed of. Members of the clubs pay individually for any breakage they may have.

Boy archers

At the Montello school, students become eligible for membership in the archery clubs by the following steps:

The first "bull's-eye" scored registers the archer in the "Bull's-eye Club." Ten "bull's-eyes" promotes the member to the "Bully Bull's-eye Club." Offhand, it seems to be a "bully" sport. The "20 Club" enrolls girls only who score 20 to 30 points in one end. The "30 Club" enrolls those who score 30 to 40 points in one end. The "40 Club" has on its roster only those who score 40 to 50 points in one end.

Coach Constance describes his teaching procedure as follows: "I first demonstrate how to string and unstring a bow properly. Then I let the students practice the procedure. I stress never pulling a bow unless the archer is on the line. Next I teach the student proper stance — feet should be well spread and body weight should be evenly distributed. Leaning into a shot will spoil the best aim. The left hand should be relaxed — not used to shove out the bow. The right hand does all the pulling; the index and next finger are used to grip the arrow and balance it on the string; the fourth finger is the power finger. That means that three fingers should be on the string. I like to have my students pull the arrow back until the bowstring 'splits' the nose, lips, and chin; and the chin should be 'anchored' in the hollow formed between the thumb and index finger. The hand then rests slightly along the side of the face or jawbone. The arrow, the hand, and the arm should form a straight line level to the ground for any short distance shooting. 'Anchor' should be held momentarily; and then the three fingers should be straightened out quickly, thus releasing bowstring and arrow. Position should be held until the arrow hits the target. That is paramount in eliminating *oomphing* the bow. Possibly such procedure appears formal and affected, but it does give results. Maintaining proper anchor will prevent overpulling any bow and will develop an archery *touch*, for *anchor* distance is always the same, provided stance and posture are never altered."

Coach Constance makes use of awards in his archery project. Requirements for awards are: scholastic eligibility, participation in five interschool contests, and 75 earned points. "These points we scaled," said Mr. Constance, "on such items as: club duties and offices; raising funds; building, owning, and/or loaning bows; acting as scorers and captains; participation in contests, exhibition and invitational shooting; scoring 50 or more points in one end; having a minimum 25 end, average of 30 for girls and 35 for boys; team membership; points for the highest four placements in each shot; two extra points for a victory; and use of cars in bringing contestants to local matches or for away-from-home contests.

"Points earned this season serve as a starter for next season's activities. That, of course, eliminates seniors. Awards were presented as a part of class day exercises. Succeeding awards will be made as each member earns his first or additional, 75 points.

"The club's second award is to be a 6-inch Velo-nap emblem that shows a miniature target and stand, with the wording around the outer ring, 'Montello High School Archery Club.'"

Coach Constance's archery clubs have participated in outside competition to some extent, but the clubs were not originally organized for that end. Some interest is also astir to the possibilities of archery in game hunting. Near-by counties offer some excellent opportunities for that type of archery activity. However, Mr. Constance is mainly interested in what the toxophilite can do locally at Montello for the youth of that community — recreation, wholesome pastime, better posture, better physical vision, improved general good health.

COFFEE TABLE

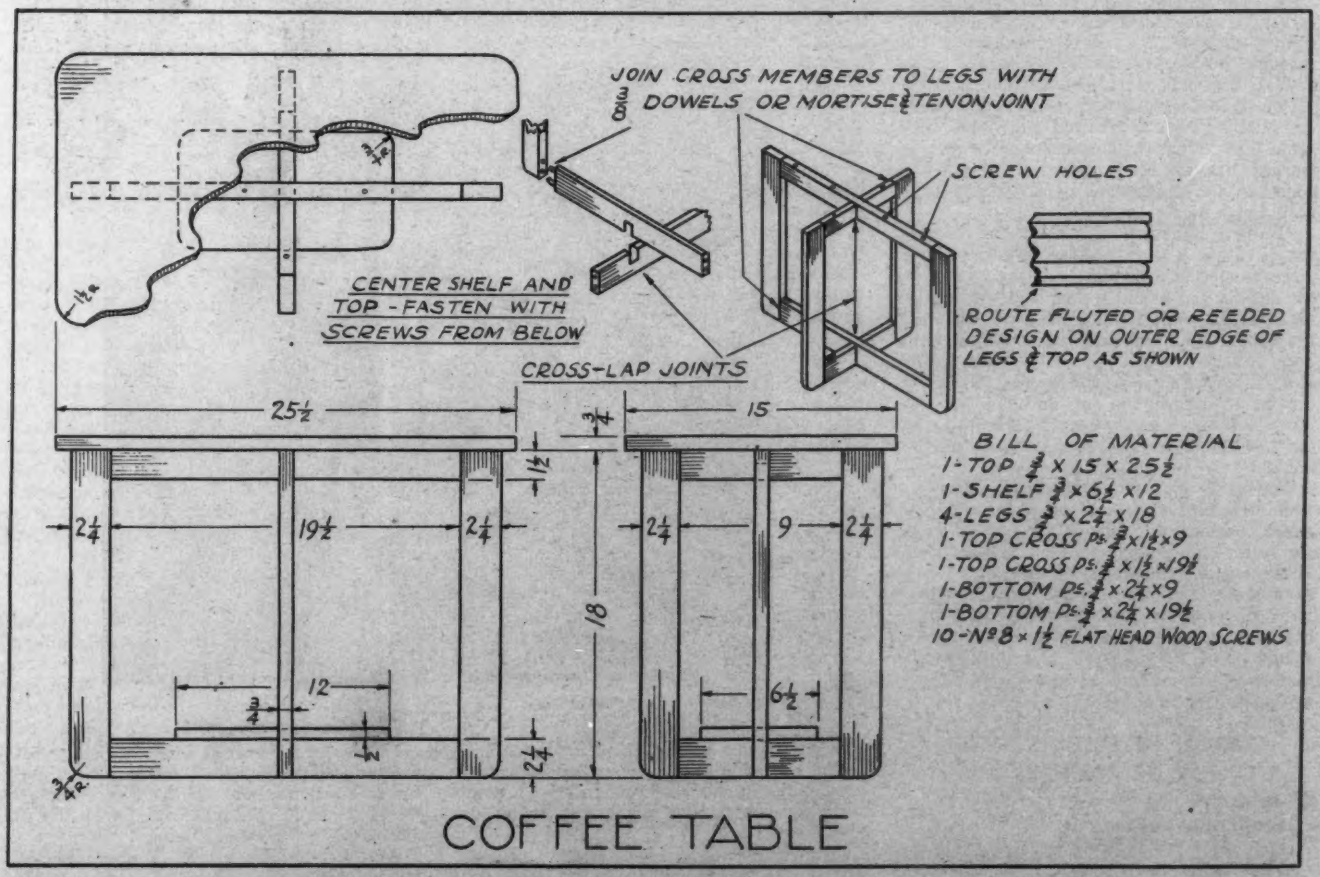
CHARLES L. FRANK

High School
Brewster, Ohio

This coffee table has been a popular and inexpensive project in ninth- and tenth-grade woodworking classes. The design is simple but effective. Walnut or any good cabinet wood may be used. This project can be constructed easily with hand tools only. It also makes a good machine tool project for students with some experience. Slight changes in sizes or design are permissible.

Sizes in the bill of materials assume dowel joints. If mortise-and-tenon construction is used, make allowance for tenons where necessary.

While the procedure followed in construction is relatively simple and self-evident, the student should carefully plan his procedure before actually beginning the work. This provides for performing such operations as counterboring for screws at the most practicable time.



Coffee table designed by Charles L. Frank, High School, Brewster, Ohio

A COURSE IN PLASTICS

FRANK D. DOLAN and
HAROLD A. SCHULZ
Ordnance School
Aberdeen Proving Ground, Md.

The long standing interest of vocational educators in plastics is easily understandable. Not only do plastic materials constitute an entirely new medium for both artist and craftsman, but they also possess a number of characteristics which make them especially suitable for inclusion in woodwork, general shop and machine-shop courses. In addition to being extremely attractive, plastics are light in weight and easy to handle. They don't splinter or chip and thus are very safe to use even in inexperienced hands. The ease and speed with which plastic materials can be machined, the full play they give to persons of imagination and creative ability, the attractiveness of the finished product — all these result in a student motivation that can seldom be surpassed. Finally, no special equipment is needed which cannot be easily and inexpensively made.

In planning a course in the working of plastics, shop instructors may find the wartime experience of the Ordnance School at Aberdeen Proving Ground of considerable assistance. In addition to making extensive use of transparent plastics for the construction of teaching aids, such as carburetors, rocket projectiles, cooling systems, and artillery and bomb fuses, the school also trained enlisted men and WACS to serve as instructors of wounded veterans in the Surgeon General's occupational therapy program.

The course consisted of eight hours of instruction per day, six days a week for three weeks. Taught as the course was under ideal conditions and by experienced instructors, it was found that student progress was extremely rapid. Civilian instructors faced with the necessity of integrating their courses into established curriculums will probably find it abvisable to proceed at a more measured pace. Much will depend, too, on the extent to which the students have received prior training in the use of hand and machine tools. It happens that the Ordnance School course was taught to completely unskilled medical corps personnel and therefore the hours indicated in this article represent the maximum that should be necessary in any training program. Modifications in time allotments will have to be made in the light of the instructor's knowledge of the skill of his students.

Elements of Plastics

Types of Plastics

Plastics are divided into two general types: (1) thermoplastics and, (2) thermosetting plastics. We are concerned primarily with the first type.

1. *Thermoplastics* — include all those plastic materials which can be heated and formed, reheated and reformed. They can be routed, drilled, tapped, sanded, and polished. Only two thermoplastics are used in this course: cellulose acetate and methyl methacrylate. They are similar in appearance but differ in both physical properties and chemical composition.

a) *cellulose acetate* — made from cotton lints, acetic acid, acetic analyne, sulphuric acid, and acetone. It has the following characteristics.

(1) Burns very slowly
(2) Low heat resistance
(3) High water absorption
(4) Unlimited color possibilities

Shaping plastics on the milling machine

(5) Not perfectly clear; discolors with age
(6) Specific gravity 1.20 (about ½ that of glass)
(7) Obtainable in both sheet and powder form
(8) High resistance to shock and impact
(9) Unaffected by gasoline or other hydrocarbons
(10) Soluble in acetone which therefore can be used as a solvent binder
(11) Low conductivity of light around curves.

b) *Methyl Methacrylate* — made from petroleum, coal, air, and water. It has the following characteristics:

(1) Burns very slowly
(2) Heat resistance much higher than that of cellulose acetate
(3) Low water absorption
(4) Unlimited color possibilities
(5) Crystal clear; no discoloration with age
(6) Specific gravity 1.19 (similar to hard rubber)
(7) Obtainable in both sheet and powder form
(8) High resistance to both shock and impact
(9) Unaffected by gasoline or other hydrocarbons
(10) Methylene dichloride used as a solvent binder
(11) Good conductivity of light around curves

2. *Thermosetting Plastics* — includes all plastics which retain their shapes and cannot be reheated and reformed. Like thermoplastics, they can be worked on a lathe, shaper, or milling machine and may be routed, drilled, tapped, sanded, and polished.

Using the band saw for sawing a plastic sheet

Fabrication

There is nothing mysterious about hand working or machining plastic materials. The same rules that apply to woods and metals also apply to plastics. They should be treated pretty much as the machinist treats copper or brass with the additional factor that precautions must always be taken to avoid any undue pressure or haste which might result in the generation of enough heat to cause the plastic to soften.

1. *Planning* — It is absolutely essential that every detail of a job be carefully planned before the work is begun. Usually this planning takes the form of complete and accurate drawings of the parts to be cut. If the drawings can be made actual size so much the better. They can then be placed under the plastic and "traced" with a scriber. In addition to the drawings it is highly desirable to make use of jigs wherever practicable. It will be founded that a little time spent on the manufacture of a few simple jigs will be amply repaid in the quality of the finished product.

2. *Cutting*

a) Breaking: Like glass, cellulose acetate but not methyl methacrylate may be broken along a scribed line providing the piece to be broken is no more than 1/16 in. thick. A fine

Plastics can be turned on a lathe

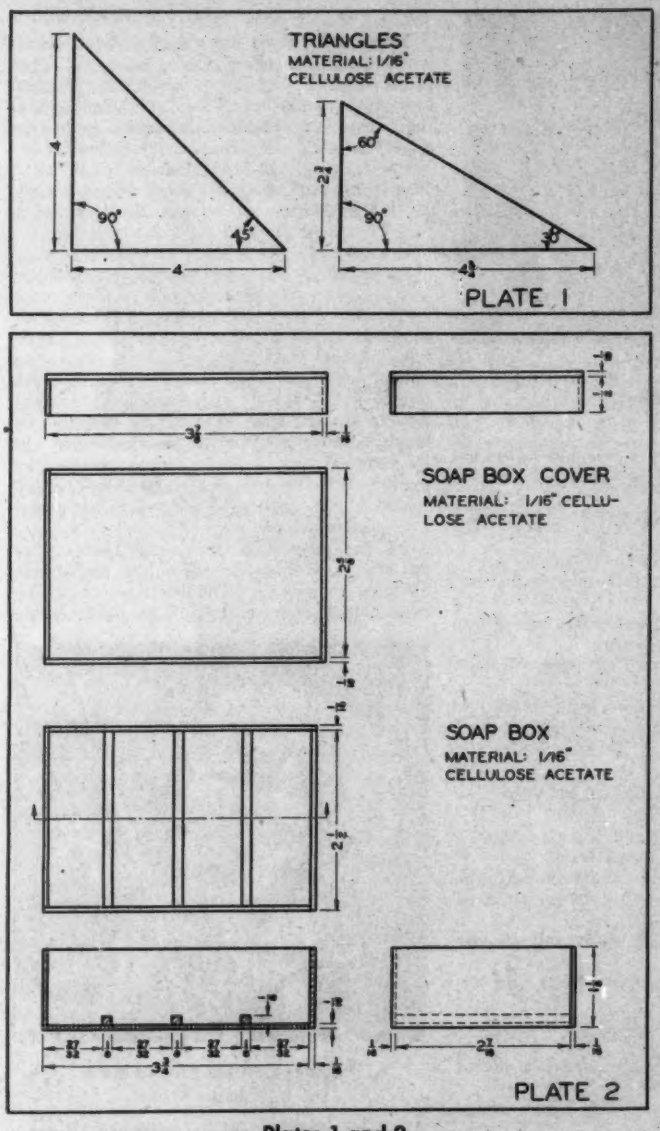
pointed scriber should be employed to cut a line that penetrates at least 1/3 of the thickness of the plastic. The depth of penetration depends not on the pressure applied to the scriber but upon the number of times it is drawn along the line. Excessive pressure on the first strokes makes the scriber difficult to control.

b) Sawing:

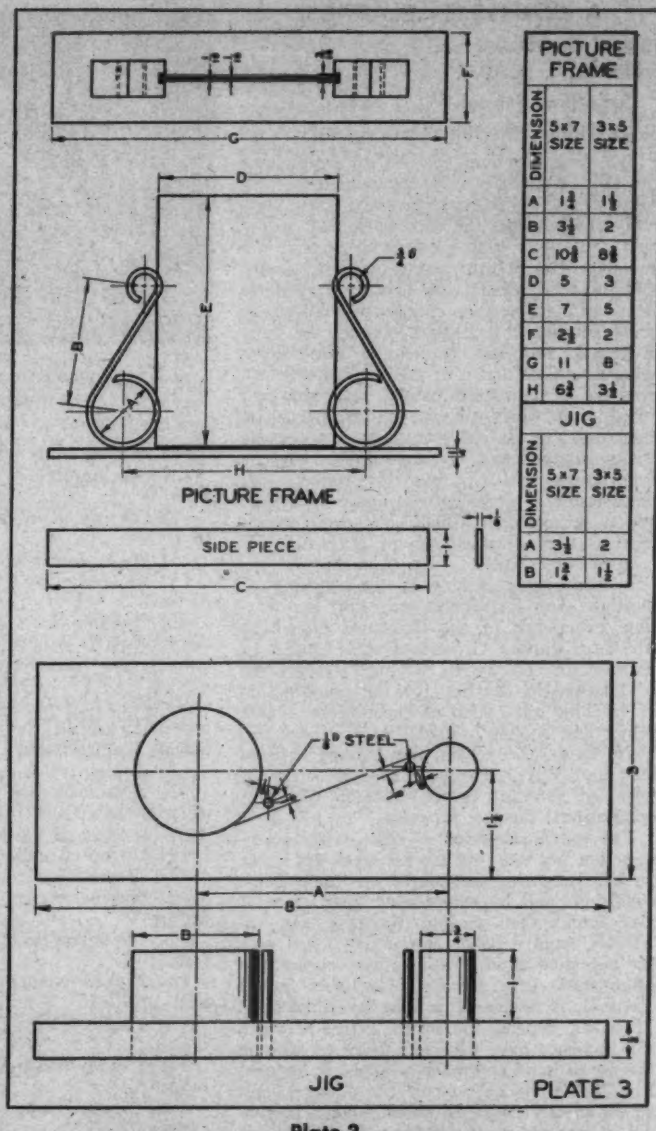
(1) Handsaws and coping saws may be used satisfactorily but the work must be held firmly in a vise or clamped to the bench. If care is not taken on this point it will be found that the plastic will break away along the edge of the cut.

(2) Power saws ordinarily used for cutting wood and metal may be used with plastics. The same speeds and the same number and set of teeth normally used on wood or metal will prove satisfactory. *Cardinal Rule* — To avoid overheating, *never force the plastic into the blade.*

3. *Turning* — All of the usual turning operations may be employed in machining plastics. Plastics can be faced, centered, turned, bored, drilled, knurled, or threaded. The tool bit should have either negative rake or no rake at all and should not have too wide a cutting edge. A parting tool may be used for turning.



Plates 1 and 2



PICTURE FRAME		
DIMENSION	5×7 SIZE	3×5 SIZE
A	1¾	1¼
B	3½	2
C	10⅜	8⅜
D	5	3
E	7	5
F	2½	2
G	11	8
H	6¾	3½

JIG		
DIMENSION	5×7 SIZE	3×5 SIZE
A	3½	2
B	1¾	1¼

Plate 3

Drilling and threading operations and centers should be lubricated as usual. When boring thin collars, particular care should be taken in the chucking because the material will spring out of line under excessive pressure. Excessive overhang of the tool bit will cause chatter marks which are difficult to work out.

4. *Milling* — Any milling operation may be performed successfully provided it does not involve the development of excessive heat. Zero rake or negative rake will produce the best results. Although cutting plastic is pretty much like cutting hard soap, it should be remembered that soap will not *burn*. If hand feed is used the feed should be steady and should not be stopped until the cut is complete because the resulting ripple will be difficult to work out later. Small engraving tools can be adapted to fit the machine and used to inscribe circular and straight line decorations.

5. *Shaping* — A shaper can be used for removing stock and finishing. It can also be used to scribe straight line decorations which appear as etched lines on the surface of the finished product. When taking a finish cut, care should be taken to keep the tool from bouncing on the surface of the plastic.

6. *Drilling* — The drill press may be used with a drill or a hole saw. The latter will be found particularly useful. It consists of nothing more than a saw blade held in a circle by a jig. As in other operations, the drill should have either negative rake or no rake at all.

7. *Grinding* — In grinding plastics, an open wheel with a weak bond is preferred. A narrow cutting edge should be used, the wheel should be dressed frequently, and plenty of coolant should be employed. All grinding operations should be performed with the greatest caution. Small hard grinders can be used very effectively for removing small burrs and for cutting irregular designs in the plastic. A small buffing wheel attachment can be used to buff small holes and corners.

8. *Sanding*

a) Hand sanding — Hand sanding is necessary to prepare a joint for cementing. For best results use a circular motion and Speed-wet abrasive paper with water. Grits from No. 200 to No. 400 will be found suitable.

b) Power sanding — Belt and disk sanders are most desirable equipment for a plastics shop. Wet belt sanders are ideal because they help control the heat generated in sanding. *Cardinal Rule: To avoid overheating, never force the work against the paper.*

(To be continued)

ARTISTIC FLORAL CANDLEHOLDERS

AUGUSTINE J. BREZINA

Long Island City, New York, N. Y.

Ornamental and useful, these unique floral candleholders provide an interesting project for metal-shop students. Made of copper, the candeleholders are given a simulated scratch finish, characteristic of spun metal, adding to the beauty of the project.

The construction of the candelholders may be begun with the layouts of the various sections involved. See Figures 1 and 2. By using the square method, the size and shape of the parts may be easily controlled to suit the individual.

After the patterns have been transferred to the metal, cut them out to their required shape with tin snips. Dress all edges with a file, finishing with strips of emery cloth. The

scratch finish is obtained through the use of a rather simple faceplate jig as shown in Figure 3. The component parts of the candleholder are secured to the faceplate with a fiber washer and a roundhead screw. Using medium speed and 80 grit emery cloth, a very pleasing effect is obtained. A more conservative satin finish may be produced by employing light oil with a finer grade of emery cloth. Thus with the jig, the individual has at his disposal a variety of textures, ranging from very coarse effect to a fine smooth satin finish. Both sides of the parts are finished, followed by the application of clear metal lacquer to preserve the effect. It would be wise to handle the pieces with a cloth prior to lacquering to prevent finger marks and stains on the bright copper surface. The polishing method is not only unique in its spunlike effect, but it also saves much time and energy over the conventional hand polishing method. Notice in Figure 4 that a base consisting of a copper ring 2¾ by 5/16 in. is attached to the underside of the body. This of course should be soldered prior to the polishing process.

The construction of the candleholder body and petals is followed by making the cup or receptacle for the handle. These are easily fabricated as seen in Figure 5. Excess solder is filed off, and then the pieces are also polished and lacquered. In the assembly process, the petals are shaped to their natural position with the hands, the use of a mallet being unnecessary. Refer to the photographs and top view in Figure 6 for the desired shape of the petals. Notice too that the leaf ends on the body are given a slight upward curl with

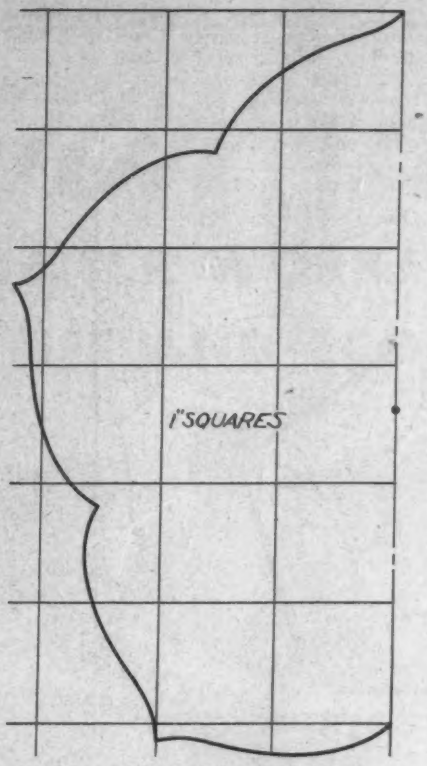


Fig. 1. Layout of the body blank

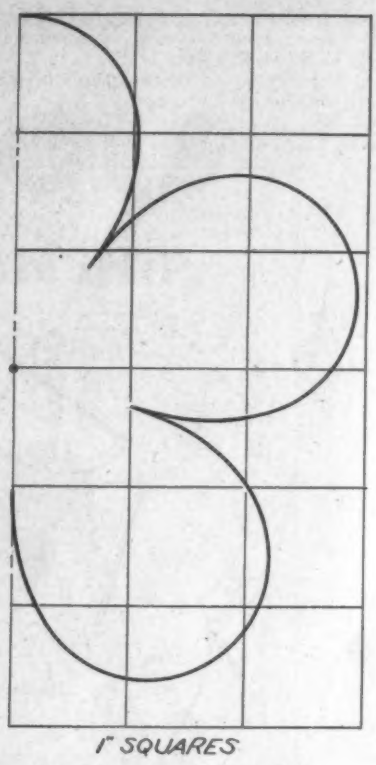


Fig. 2. Layout of the petals

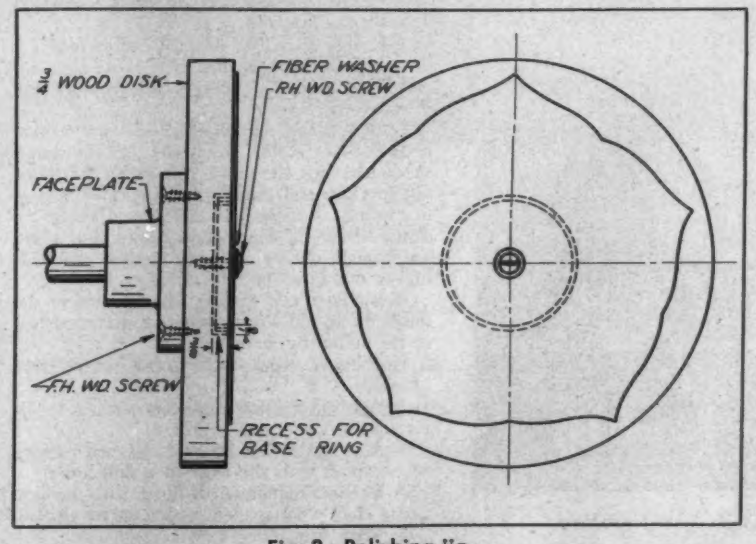


Fig. 3. Polishing jig

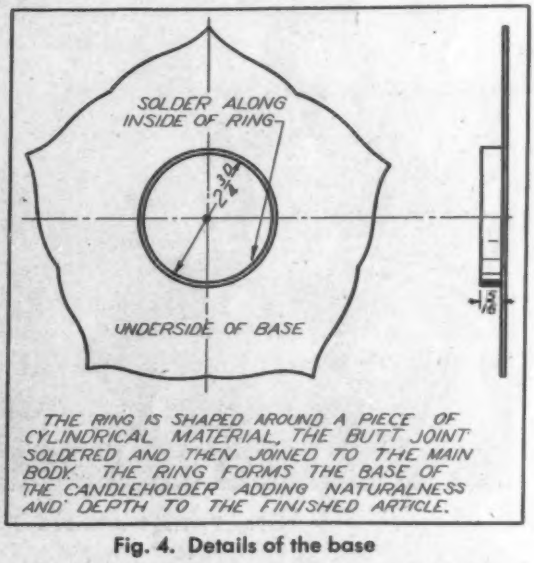

SOLDER ALONG INSIDE OF RING
2 3/4
UNDERSIDE OF BASE
1/16
THE RING IS SHAPED AROUND A PIECE OF CYLINDRICAL MATERIAL, THE BUTT JOINT SOLDERED AND THEN JOINED TO THE MAIN BODY. THE RING FORMS THE BASE OF THE CANDLEHOLDER ADDING NATURALNESS AND DEPTH TO THE FINISHED ARTICLE.

Fig. 4. Details of the base

the hands, to create naturalness and depth to the flower.

Assembly of the units consists of uniting them with a ⅛ by 5/16 rivet, the rivet being headed on the underside of the base.

Although the sections of the candleholder could have been soldered in assembly, the project was planned to eliminate unnecessary work after the parts were polished and lacquered. Then again the ⅛-in. holes, which were used to hold the units during polishing, serve equally well for the riveting procedure. Thus in the construction sequence, notice that once the parts have been polished and lacquered, they undergo very little tool work. They may be handled safely, even bent to final shape without fear of stain marks and

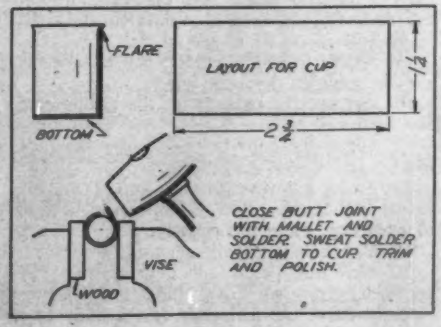


Fig. 5

fingerprints, which is something to strive for in working with polished copper.

BILL OF MATERIALS — Copper, 19 Gauge (.042)

No. of pieces	*Part*	*Material*	*Size*
2	Body	Copper	6½ x 6½
2	Petals	Copper	6 x 6
2	Cups	Copper	1¼ x 2¾
2	Cup bottom	Copper	1 x 1
2	Ring base	Copper	5/16 x 8¾
2	Rivets	Copper	⅛ x 5/16

Solder, flux, metal lacquer

Tools

Tin snips, file, emery cloth (assorted grits), drill, rule, soldering copper, lathe faceplate, lathe, small lacquer brush, pencil and scriber.

Procedure

1. Make layout drawing of candleholder body as shown in Figure 1.
2. Transfer layout to two pieces of metal stock with pencil or scriber.
3. Drill ⅛-in. hole in the center of each piece. This will facilitate the polishing and assembly process in subsequent operations.
4. Cut out the two body blanks with tin snips.
5. File and polish all edges with strips of emery cloth.
6. Fabricate the base ring as shown in Figure 4.
7. Solder the ring to the underside of the body.
8. Secure the piece to the faceplate with a r.h. screw and a fiber washer. See Figure 3.
9. Using medium speed and 80 grit emery cloth, apply the scratch finish. Polish both sides.
10. With a small hand brush apply clear metal lacquer to the polished section. Both sides should be lacquered.
11. Avoid touching the bright surfaces with hands prior to lacquering. Use a cloth while handling. Once lacquered set aside to dry.
12. Make layout drawing of the petals as shown in Figure 2.
13. Transfer the pattern to the metal with pencil or scriber.

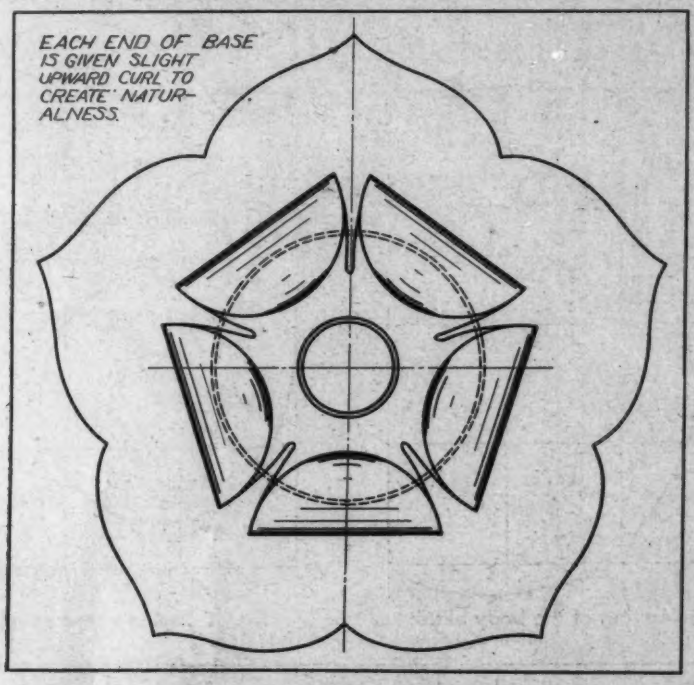


Fig. 6. Top view of candleholder

Fig. 7. The finished candleholder

14. Cut out two blanks with tin snips, and file and dress all edges to a smooth finish. Drill ⅛-in. hole in center of pieces.
15. Secure to the faceplate, polish, lacquer, and set aside to dry. See Figure 3.
16. Lay out the pattern for the candle cup. See Figure 5.
17. Shape the cups to size, solder the butt joint.
18. Sweat a bottom to each cup. Trim, file excess solder away, drill ⅛-in. hole in bottom of each cup. Flare top slightly.
19. Polish, lacquer, and set aside to dry.
20. Give the petals the desired shape by gentle hand pressure. No mallet is necessary. Slightly curve the leaf ends of the body to a raised position.
21. Assemble the three parts: body, petals, and cup with a ⅛ x 5/16 rivet. Use a ¾-in. steel rod to support the rivet while it is headed on the underside of the base with a ball-peen hammer. This done, the candleholders are completed.

FINISHING A WALNUT GUNSTOCK

HENRY J. EWING

Central Junior High School

Anderson, Ind.

Most American made guns are fitted with walnut stocks. Crotch and stump walnut are used on the better grades of arms while straight grained walnut is used on the less expensive models.

Characteristics of a Good Finish:

1. The finish should protect the wood against moisture.
2. It should be a finish that does not readily show scratches.
3. The finish should be of a type that can be revived from time to time, thus increasing its resistance to moisture, and at the same time concealing small scratches.
4. The finish should bring out the beauty of the grain in the wood to the fullest extent, thus improving the appearance of the gun.

Advantages of a Good Finish:

1. The advantages in using a good type of finish is that the finish enters the cells of the wood and does not just lie on the surface; therefore, it will not chip and show scratches like a surface built up of thick coats of varnish or lacquer.
2. The finish can be polished and revived.
3. It is water resistant.
4. The finish with proper care actually improves with use.

Many stains are not successful on walnut because they color the wood all the same shade and hide the grain. Any finish that does not increase and bring out the natural beauty of walnut is inefficient. The real beauty of walnut is in its contrasting colors, and these are brought out by using the method of finishing as described in this article.

Removal of Old Finish: The removal of the finish on an old stock should be accomplished in the following manner:

1. Remove stock from action or receiver of gun.
2. Apply varnish remover according to directions of the manufacturer.
3. After finish has become softened remove by scraping with the edge of a dull knife.
4. Remove remainder of finish with medium grade steel wool soaked in denatured alcohol.
5. Wipe stock dry with a clean cloth, and rub stock a second time with clean steel wool and denatured alcohol. This will remove all the softened finish from the surface of the wood, as well as the wax in the varnish remover. Never use mineral spirits or turpentine as these materials will dissolve the wax in the remover and spread it over the surface.
6. Allow stock to dry 24 hours.

Be sure to remove the entire finish completely if the stock contains deep dents or scratches. This can be done by scraping the wood with a flat cabinet scraper or small pieces of glass.

Use of Abrasives: The use of the proper abrasives in a finish of this kind is very important in order to obtain a perfectly smooth

(Continued on page 18A)

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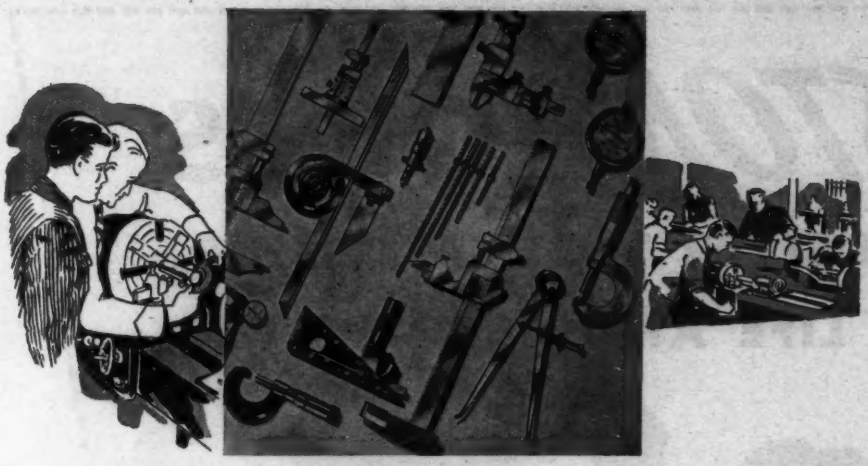

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(Continued from page 468)

and even surface on the wood. This can be done by the following method:

1. File stock at an angle with a mill file. This will remove the ridges left by the scraper.

2. Sandpaper stock with the grain of the wood using No. 120 abrasive cloth. Finish off with numbers 280, 320, and 400 speed-wet. At this stage of the work the wood should be very smooth when felt with the back of the fingers.

3. Remove all dust with a clean, stiff brush.

Raising the Grain and Sanding: From this point on the wood must be kept clean, as perspiration from the hands will cause spots on the wood, which will show through the finish when the job is completed.

1. Raise the grain of the wood by sponging lightly with water. Immediately after applying the water hold the stock over a gas flame. This will dry the wood quickly and raise the grain.

2. The raised fibers of the wood should now be cut off by sanding lightly with number 280 speed-wet paper. Do all sanding with the grain, but against the raised fibers of the wood. Repeat the sponging, raising the grain and sanding until the fibers of the wood no longer rise. On some types of walnut ten or twelve spongings may be necessary. The purpose of this operation is to ensure the grain of the wood against rising at a later date if the stock becomes wet.

3. Sandpaper stock with numbers 320 and 400 papers, applying as much pressure as possible with the hand.

4. Remove all dust from the wood with a clean, stiff brush, and rub stock vigorously with crocus cloth. This will glaze the surface of the wood and tend to bring out the appearance of the grain during the finishing and polishing operations.

Application of Oil: Apply a good grade of raw linseed oil to the wood with a cheesecloth pad, going over the stock again and again as the oil soaks into the wood. Wipe off excess oil with a clean piece of cheesecloth and let the stock dry in a warm place for at least two weeks. This oxidation of the linseed oil will make a suitable foundation for the succeeding finishing coats.

Formula for Finish: The following materials should be put in a large mouthed jar so the mixture can be stirred each time before application:

Spar varnish — 1 ounce
Turpentine — ½ ounce
Boiled linseed oil — 3 ounces
4 lb. white or orange shellac — 1¼ ounces
Denatured alcohol — 1¼ ounces

Application of Finish: With a one-inch clean brush apply a coat of the above mixture to the wood, brushing with and across the grain. Go over the stock several times in this manner being sure to keep the mixture well stirred. Allow this coat to dry at least a week, and repeat the application of the mixture until the wood is well coated, and let the finish dry another week.

Removing the Dried Film: The next step in the finishing schedule consists of grinding the partly dried film from the surface of the wood. This is done by gluing a piece of 2 by 8-in. hard felt to a piece of 1 by 2 by 14-in. wood. Give the felt a thin coat of machine oil, and sprinkle with powdered pumice stone. Clamp the stock on the bench or put in a vise and work the felt across the grain of the wood, grinding the partly dried film from the surface and into the cells of the wood. After this operation has been completed, the pores of the wood will be filled and the finish will be in the wood.

Follow up by using rottenstone on the felt. This will give the finish a polish not otherwise obtained.

Rub the stock vigorously with a clean piece of cheesecloth. Then apply a teaspoon of raw linseed oil, rubbing this in with the palm of the hand. Let dry several days and assemble stock and gun.

Future Care of the Stock: In several months the finish will begin to dry out, and upon rubbing the stock with the bare hand a gloss will be noted. To revive the finish from time to time apply several drops of raw linseed oil as a polish. Do not make the mistake of using too much oil, as it will eventually gum on the surface, collect dirt, and obscure the grain in the wood.

Personal News

♦ Dr. Sherman Dickinson, head of the agricultural education department, University of Missouri has gone to Brazil as consultant and specialist in agricultural education.

♦ Hartingh W. Babcock, of Detroit, Mich., has received a year's leave of absence to become co-ordinator of diversified co-operative training at the Tarpon Springs, Fla., high school. The plan which is known as D.C.T. was started in 1933 in Jacksonville, and has grown by leaps and bounds. Tarpon has started the work this year so that 34 schools are offering the work in Florida. The D.C.T. program makes it possible

(Continued on page 20A)

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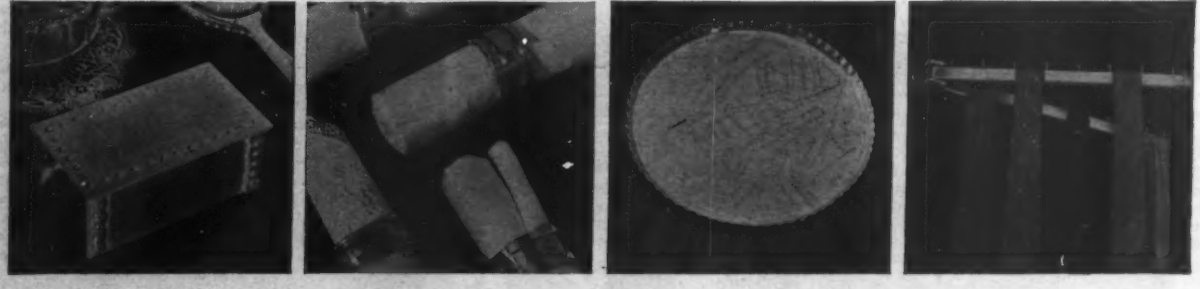

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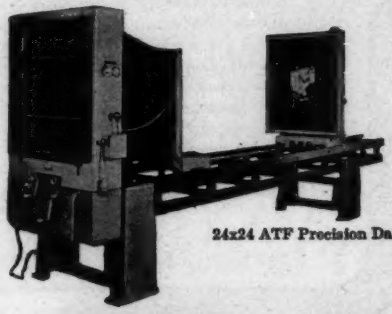

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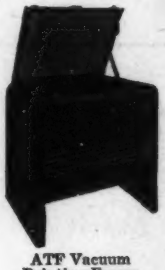

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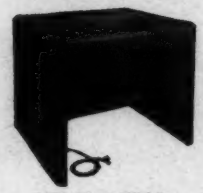

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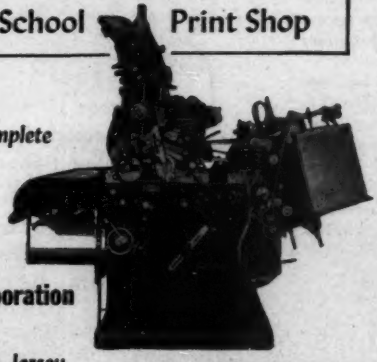

ATF Chief 22 Offset Press

(Continued from page 18A)

for the schools to use the business establishments of the community as laboratories. Pupils attend school four hours in the mornings and work four hours in the afternoons. Each student receives credit for his work experience and graduates with his class. The schoolwork is directly related to the specific type of work carried on in the afternoons. Upon graduation, all of the pupils are ready for good positions for which they have been thoroughly trained.

♦ ROBERT LLOYD CANTOR has been granted a professorship in the West Virginia Institute of Technology at Montgomery, W. Va. He has recently completed three years of educational service in the U. S. Naval Reserve.

♦ FRANK MACMILLEN, of New York City, has become a member of the staff of the American Standards Association. Mr. MacMillen was formerly a member of the staff of the *New York Times*.

♦ HERMAN HJORTH, formerly of Yonkers, N. Y., is now located in Copenhagen, Denmark.

♦ H. F. HINTON has been appointed state supervisor of trade and industrial education for Florida.

♦ H. E. WOOD, formerly district supervisor, has been appointed state supervisor of agricultural education for Florida.

♦ T. L. BARRINEAU, JR., has been made district supervisor of agricultural education for Florida. He replaces H. E. Wood, who has been appointed state supervisor.

♦ G. C. NORMAN has been appointed veterans' supervisor for vocational agriculture for the state of Florida.

♦ GLENDON O. ARVIN, who was graduated from the Illinois State Normal University in 1938 and attended the University of Florida in 1940 where he specialized in diversified occupations, has joined the industrial-arts staff at State Teachers College, Indiana, Pa. He taught two years in Georgia, where he served as a co-ordinator, two years in the Riley School at East Chicago, and three years at Sandwitch, Ill.

♦ HARRY BARRICK, who was graduated from Indiana State, and secured his master's degree at Indiana University, has been appointed to the industrial-arts staff at State Teachers College, Indiana, Pa. He taught one year at Staunton, four years at Bloomington, and one year at George Washington High School in Indianapolis. He has had four years of trade experience, with one year as personnel worker, and three years as foreman in a machine shop.

♦ HAROLD SNIDOW, a graduate of the Colorado State College in 1934, has joined the industrial-arts staff at State Teachers College, Indiana, Pa. He taught seven years in the schools of Colorado, and received his master's degree from Colorado A. & M. College, Fort Collins, in 1941. After teaching at Nebraska State College at Chadron, he resigned in 1944 to accept a position in Champaign, Ill., in order to continue work on his doctorate at the University of Illinois.

♦ L. B. PERRY, formerly teacher of industrial-arts classes in the high school at Rochester, Ind., has retired after half a century of teaching. Mr. Perry, who began his teaching career in 1892 in a Hoosier country school, later took charge of seventh- and eighth-grade work in Arcadia. Because of his interest in woodwork, he combined his knowledge of working with wood and teaching and set up a small workshop in Arcadia. After teaching in the school for three years, he went to Cicero, Ind., to teach industrial arts and other subjects in the high school. He spent two years at Muncie Normal Institute and one year at Bradley Polytechnic Institute preparing himself for teaching. In 1914 he went to Rochester to take over the shopwork there. He resigned on January 18, 1946, from schoolwork, but will continue to make his home in Rochester.

♦ RAY WILLIAMS, who formerly headed the day and evening programs at Parsons, Kans., will continue to act only in the capacity of director of the evening program.

♦ JOHN POGSON, Topeka, Kans., has been appointed to instruct the day trade machine-shop classes at the Topeka Trade School. Mr. Pogson worked at the machinist trade before his appointment. During the war he was foreman of the machine shop at the Topeka Automotive Ordnance Depot.

♦ STANLEY J. PAWELEK, supervisor of industrial education, Baltimore, Md., was a member of the 1946 summer school staff at Utah State Agricultural College.

♦ FREEMAN D. KETRON has joined the Indiana State rehabilitation staff.

♦ O. H. BEATY has been appointed supervisor of trade and industrial education to succeed Lawrence Parker, who resigned a year ago.

Mr. Beaty was appointed to the position of assistant supervisor of trade and industrial education on November 1, 1939, and was acting supervisor during the past year.

Previous to that he taught industrial arts, day trade machine shop, and related instruction in the co-operative part-time program at Newton, Iowa. He also was co-ordinator of the co-operative part-time program for two years, and the supervisor of the industrial education program for the same length of time in the high school at Newton, Iowa.

♦ DR. JOHN L. FEIRER has been appointed assistant director of vocational education in charge of industrial arts education at Western Michigan College, Kalamazoo, Mich. Dr. Feirer holds the B.S. degree from The Stout Institute, Menomonie, Wis., M.S. degree from the University of Minnesota, and recently completed the doctorate at the University of Oklahoma. Previous to his return to Western Michigan College, he served for three and one-half years as lieutenant in charge of the basic Metalsmith School at N.A.T.T.C., Norman, Okla. He is author and co-author of several books including: *Modern Metalcraft*, *Basic Electricity*, *Basic Bench Metal Practice*, and *Basic Machine Tool Practice*.

♦ NORMAN RUSSELL, a 1946 graduate of Western Michigan College, Kalamazoo, Mich., has

(Continued on page 22A)

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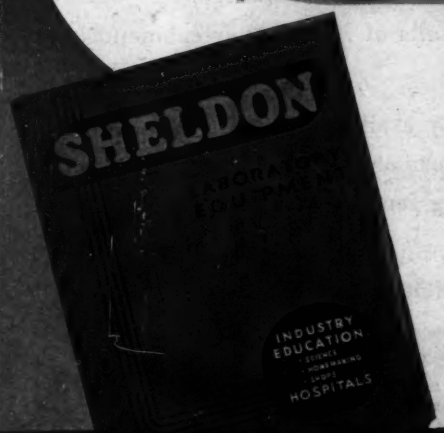

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(Continued from page 20A)

been appointed to a teaching position in the aviation mechanics division at the college. He will teach airplane maintenance, welding, and sheet metal.

♦ NEIL SCHOENHALS, a 1940 graduate of the industrial arts department of Western Michigan College, Kalamazoo, Mich., has been appointed a teacher at Western State High School in the industrial arts department. He will handle the high school and training school classes.

♦ GEORGE J. FREY, information counsel with the Kansas State Board for Vocational Education, assumed similar duties with the State Department of Public Instruction on October 1.

Formerly a newspaperman at Arkansas City and Pittsburg, Mr. Frey taught journalism in Pittsburg High School before joining the staff of the State Board for Vocational Education in 1942. In 1943 he entered the army. He was discharged in the spring of 1946.

♦ H. A. STARKEY, formerly instructor in the industrial-arts department of the Great Bend, Kans., high school, has been appointed director of the vocational evening program in that city.

♦ PAUL KOMATZ has been appointed director of the industrial-education program at Parsons, Kans. He has been an instructor in the program for several years.

♦ L. W. WINKEL during the summer conducted janitor-engineer training courses at Macksville, Kans. A similar course was conducted in Wichita during the week of September 29.

♦ CLAYTON E. BUELL, of the Edward Bok Vocational School, Philadelphia, Pa., has been transferred from vocational education into general education. He expresses the conviction, however, that vocational education has provided the background and experience necessary for the new job.

♦ STANLEY J. DRAZEK, after receiving his discharge from the armed forces, was awarded a fellowship by the University of Maryland, where he will pursue graduate work under Dr. R. Lee Hornbake.

Its remarkable ability to "stay put" in spite of time and changing weather conditions, is one reason for the wide use of mahogany in airplanes and boats. It was this same quality that helped make mahogany the favorite material of the master cabinetmakers of the eighteenth century.

Association News

A.V.A. CONVENTION IN ST. LOUIS

The plans for the American Vocational Association convention to be held at St. Louis, Mo., December 4–7, are being rapidly completed.

The convention city offers much to those who will attend the annual meeting of the A.V.A. It was in this city that Dr. Woodward opened the manual training school of Washington University. Visitors, therefore, will have an opportunity to tread upon historic ground not only as applied to the developmental years of our country, but also to the birth and growth of that type of education in which the members of the A.V.A. are most interested.

The following, while not complete, gives some idea of the thoroughness and scope of the material that will be covered during the various convention sessions.

The National Council of Local Administrators of Vocational Education and Practical Arts will hold its first meeting on Tuesday, December 3, at 9 a.m. Earl L. Bedell, president, National Council of Local Administrators, and divisional director, vocational education, Detroit, Mich., will act as chairman. The subject of discussion will be "What New Developments May Be Expected as a Result of the George-Barden Act?" L. H. Dennis, executive secretary, American Vocational Association, Inc., Washington, D. C., will give the address.

On Tuesday, December 3, at 2:00 p.m., a joint meeting of the National Association of Industrial Teacher Trainers, the National Association of State Supervisors of Trade and Industrial Education, and National Council of Local Administrators of Vocational Education will be held under the chairmanship of Earl L. Bedell. Dr. Joseph Tiffin, professor of psychology, Purdue University, West Lafayette, Ind., will speak on "Research Results for Trade and Industrial Education." The discussion leader will be Robert Reese, state supervisor of trade and industrial education, State Office Building, Columbus, Ohio.

David F. Jackey, director of vocational teacher education, University of California, Los Angeles, Calif., will present the topic, "Defining the Scope of Trade Competency Examinations."

The annual dinner will be held on Tuesday, December 3, at 7:00 p.m., at the Jefferson Hotel Crystal Room. The toastmaster will be Earl L. Bedell. Elmore N. Putney, president, board of education, St. Louis, Mo., will be the speaker.

At the Wedneseday morning meeting, Jesse F. Rees, vice-president, National Council of Local Administrators, and director, department of vocational education, Harrisburg, Pa., will be chairman. The subject for discussion is "How Can Vocational Education Be Made to Serve the 'Sixty Per Cent' Referred to in the Prosser Resolution?" This will be discussed by Howard E. Marvin, member of the executive committee, National Council of Local Administrators, and director, department of vocational education, Pasadena, Calif., assisted by a panel composed of Oakley Furney, New York; Galen Jones, U. S. Office of Education; J. E. Hill, Illinois; James Woodin, Kansas; and J. C. Wright, Maryland.

(Continued on page 25A)

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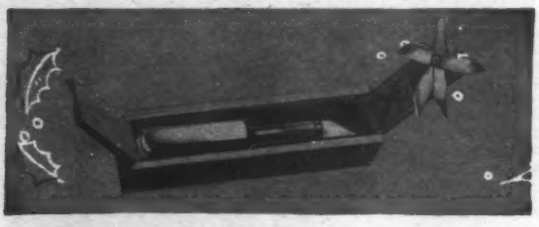

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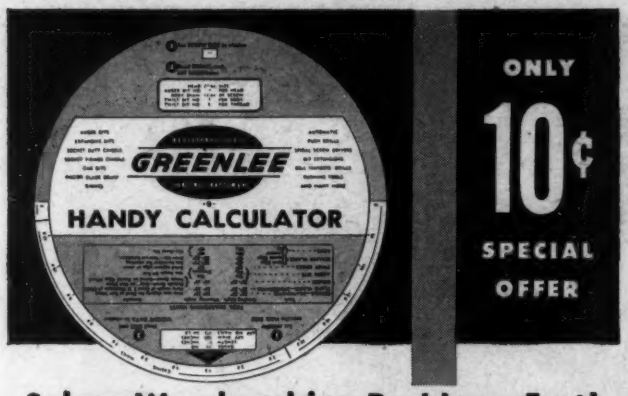

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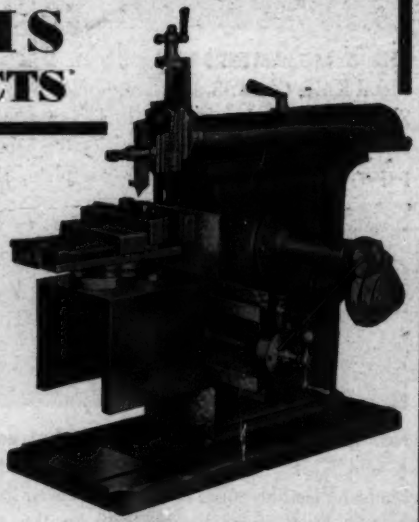

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(Continued from page 22A)

On Wednesday afternoon, Miss Clara H. Krauter, vice-president, National Council of Local Administrators, and principal, Essex County Vocational and Technical High School, Newark, N. J., will be chairman. Frank Huffaker, secretary, National Council of Local Administrators, and director, department of vocational education, Chattanooga, Tenn., will speak on "How Valid Is the Demand for Pre-Employment Training in the Evening School?"

The National Association of State Supervisors of Trade and Industrial Education will meet on Tuesday, December 3, at 9:30 a.m. The chairman at this session will be H. G. McComb, state director of trade and industrial education, Indianapolis, Ind.; and Harold Wilson, state supervisor of trade and industrial education, Frankfort, Ky., will deliver an address on "The Impact of Apprenticeship on the Trade and Industrial Program."

Samuel L. Fick, chief, bureau of trade and industrial education, State Department of Education, Sacramento, Calif., will speak on "The Current Picture in the Training of Veterans."

A joint meeting of the National Association of State Supervisors of Trade and Industrial Education, National Association of Industrial Teacher Trainers, and National Council of Local Administrators of Vocational Education will be held on Tuesday, December 3, at 2:00 p.m. Earl L. Bedell will act as chairman.

Dr. Joseph Tiffin, professor of psychology, Purdue University, West Lafayette, Ind., will present his address on "Research Results for Trade and Industrial Education." "A Report of Committee on the Study of Functions Performed in the Operation of a Local Program of Industrial Education" will be given by Arthur B. Wrigley, state supervisor of trade and industrial education, Trenton, N. J.; William Penn Loomis, specialist, supervisory and teacher training, Trade and Industrial Education Service, U. S. Office of Education, Washington, D. C.; and S. Lewis Land, director of vocational teacher education, The Pennsylvania State College, State College, Pa.

The National Association of Industrial Teacher Trainers, on Tuesday, December 3, at 7:30 p.m., will be presided over by Homer J. Smith, professor of industrial education, and department head, University of Minnesota, Minneapolis, Minn.

Deyo B. Fox, director, division of vocational and practical arts education, Western Michigan College of Education, Kalamazoo, Mich., will speak on the topic, "Improviing the Industrial Arts." V. L. Pickens, director of practical arts, Public Schools, Kansas City, Mo., will discuss "The Training of Effective Industrial Arts Teachers." G. Harold Silvius, chairman, department of industrial education, Wayne University, Detroit, Mich., will present an address on "Instructional Units for Professional Preparation in Industrial Arts."

On Wednesday, December 4, at 9:00 a.m., S. Lewis Land, president, National Association of Industrial Teacher Trainers, and director of vocational teacher education, The Pennsylvania State College, State College, Pa., will be chairman. The following committee reports will be made:

Content of Professional Courses in Curriculums for Vocational Industrial Teachers — S. Grant Conner, associate professor of industrial education, and assistant director of the Ba'timore division, University of Maryland, Baltimore, Md.;

In-Service and Alertness Courses for Vocational Industrial Teachers — Gerald Leighbody, supervisor of industrial teacher training, New York State Education Department, Buffalo, N. Y.;

Evaluative Criteria for Vocational Industrial Schools and Classes — R. W. Howes, state supervisor of industrial education, Hartford, Conn.;

Development of Instructional Materials for Related Subjects Classes for Apprentices — Joseph Fair, state teacher trainer, Trenton, N. J.

Apprentice Education

On Wednesday, December 4, at 2:15 p.m., the chairman, Philip L. McNamee, assistant superintendent of schools in charge of vocational education, Chicago Public Schools, will present Harvey A. Harris, consultant on vocational training, Wall Paper Institute, New York City, who will speak on "Apprentice Training Challenges the Schools of the Nation." Dr. Claude H. Ewing, supervisor of vocational curriculum, Chicago Public Schools, will present the subject "The Development of Related Course Materials for Apprentice Training."

The general meeting of trade and industrial education on Thursday, at 2:15 p.m., has chosen for its theme "Industrial Education From Now On." F. J. Jeffrey, principal, Hadley Technical High School, St. Louis, Mo., will be chairman. The titles of the addresses are: "Determining the Place of Industrial Education in a City School Program"; "What Labor Expects of Trade and Industrial Education From Now On"; "What Industry Expects from Trade and Industrial Education From Now On"; and "Vocational Education From Now On." The speakers are: J. C. Woodin, director of industrial education, Wichita, Kans.; Fred Karches, director of operations of the Rice-Stix Company, St. Louis, Mo.; and Joseph R. Strobel, state director of vocational education, Columbus, Ohio.

The industrial arts section on Wednesday, at 2:00 p.m., has chosen for its theme "Revision of the Bulletin entitled 'Standards of Attainment.'" The chairman will be Homer J. Smith.

Clyde A. Bowman, dean, The Stout Institute, Menomonie, Wis., will present the "History of This Publication Project."

William T. Bawden, professor of industrial education, State Teachers College, Pittsburg, Kans., will give "A Review of the 1946 Revision Process." Emanuel E. Ericson, chairman of industrial education, Santa Barbara College, University of California, Santa Barbara, Calif., will present "A Professor's Reaction to Content and Use." George F. Weber, director of vocational education, South Bend., Ind., will add "Comments by a Supervisor." Arthur B. Mays, professor of industrial education and department head, University of Illinois, Urbana, Ill., will summarize the various presentations.

At the Thursday meeting held at 2:00 p.m.,

(Continued on next page)

3 announcements in 1

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(Continued from previous page)

the theme, "Selection, Preparation and Use of Instructional Materials in Industrial Arts Teaching" will be presented by a panel consisting of Chairman, H. H. London, associate professor of industrial education, University of Missouri, Columbia, Mo., assisted by R. Wayne Adams, associate professor of industrial education, North Texas State Teachers College, Denton, Tex., Walter A. Klehm, professor and head department of industrial arts, Eastern Illinois State Teachers College, Charleston, Ill., Hugh L. Oakley, head of department of industrial arts, Eastern Kentucky State Teachers College, Murray, Ky., Alfred H. Moore, head of department of industrial arts, Eastern Tennessee State Teachers College, Johnson City, Tenn., R. H. Roberts, director of industrial arts and vocational education, Tulsa Public Schools, Tulsa, Okla., and Robert E. Smith, professor of education, The Ohio State University, Columbus, Ohio.

The theme, "Promoting Industrial Arts" has been chosen for the Friday 2:00 p.m. session. The chairman will be George F. Henry, head, department of industrial arts education, Colorado A. & M. College, Fort Collins, Colo. The subjects of the addresses are "Recruiting the Best to Teach Industrial Arts," "An Effective Program for Training Industrial Arts Teachers," "Publicizing Industrial Arts," and "Prophylaxis Against Growing Stale Teaching Industrial Arts." The speakers who will present these addresses are: Clifford K. Lush, director of industrial education, Minneapolis, Minn.; Chris Groneman, acting head of department of industrial education, Texas A. & M. College, College Station, Tex.; Lowell L. Carver, assistant professor of industrial education, Iowa State College, Ames, Iowa; and K. F. Perry, chairman, division of arts, Colorado State College of Education, Greeley, Colo.

On Saturday at 9:30 a.m., the theme, "Aluminum and Plastics Applied to Industrial Arts Education" will be considered. The chairman will be William R. Mason, supervisor of industrial arts, Cleveland Public Schools, Cleveland, Ohio. Douglas B. Hobbs, educational department of Aluminum Company of America, exhibiting and demonstrating new uses of aluminum for industrial arts education, will give an address on "Aluminum for Industrial Arts."

Dr. J. W. Richardson, district manager, St. Louis division, Rohm and Haas Co.; and G. Weller, technical representative, Design and Model Shop, Philadelphia division, Rohm and Haas Co., will discuss and demonstrate "Plexiglass — A New Industrial Arts Medium." Dr. Gordon O. Wilber, director, division of industrial arts teacher education, State Teachers College, Oswego, N. Y., will lead in the discussion.

♦ The teachers of industrial education of Missouri have organized a state-wide professional association known as the Missouri Industrial Education Association. This association combines two former organizations, the Missouri Industrial Arts Association and the Missouri Vocational-Industrial Education Association, and brings all those engaged in the different phases of the work together into one unified body.

O. H. Day, director of vocational education, Kansas City, is president of the new association; Verne L. Pickens, director of practical arts, Kansas City, is the vice-president; Noel B. Grinstead, professor of industrial arts, Central Missouri State College, Warrensburg, and Forest Whitworth, instructor of industrial arts, Maplewood, are directors; and Wray D. Silvey, co-ordinator, Eldon, is secretary-treasurer, George Kohrman, state supervisor of trade and industrial education, and Doyle Kemper, state supervisor of industrial arts are ex-officio members of the executive committee.

The association will hold two meetings annually, one running concurrently with the State Teachers Association Convention, and the other at the time of the Annual Spring Conference, usually held at the University of Missouri. — H. H. *London.*

♦ The annual convention of the Connecticut Industrial Arts Association was held in Bridgeport, Conn., on October 25 and 26 in the Bassick High School. Dr. Verne C. Fryklund, president of the Stout Institute of Menomonie, Wis., was the keynote speaker.

Dr. Fryklund drew from his many years of experience in the fields of industrial arts and vocational education in both civilian life and as head of technical training of instructors in the army.

His presentation of the topic, "What Does Today's Industrial Arts Expect of Its Teachers?" provided many points of stimulating interest.

Dr. Fryklund said, "Every student being graduated from high school should come out with some salable abilities so that he can fill a job at that time if need be." He also stated, "Moral and educational guidance should be a part of the industrial-arts instruction and every teacher of that subject should be a counselor."

As basic requirements for industrial arts teachers he listed: (1) a philosophy, (2) an understanding of people, (3) how to identify subject matter, (4) how to build a course of study, and (5) how to differentiate between trade training and industrial arts.

During the second day Dr. Fryklund answered many of the questions put to him by those present at the convention.

Besides those in the field of industrial-arts education in the state, representatives of the state department of education and superintendents of schools were in attendance.

On Saturday morning convention members were conducted on a tour of the technical arts department of the Stratford High School under the direction of Charles Quinlan, Jr.

Carl A. Wischan, Stratford, and James Lindstrom, Bridgeport, were co-chairmen of the convention program committee.

♦ The Kansas Vocational Association and the Kansas Industrial Arts Association held their annual meetings at Topeka, Kans., on Friday, November 1, 1946.

Speakers at the vocational meeting were Dr. Roy A. Hinderman, assistant superintendent of

(Continued on page 28A)

NEW BOOKS

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The eagerly awaited volume, AMERICA'S FABRICS by Zelma Bendure and her sister Gladys Pfeiffer, which was published on September 17th, is surpassing all expectations. This magnificent book, with its glowing pictures of over 1,000 fabrics and its complete, clear explanations of how they are made, has already been hailed by textile authorities as the best book ever published on the subject. It is the only complete reference work on the characteristics, uses, identification, techniques of manufacture, sources and history of every fiber and fabric being made today. 688 pages. 12 4-color process plates. Over 700 other illustrations. $10.

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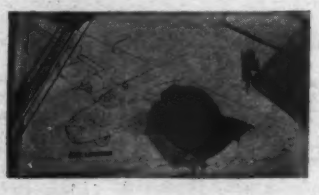

The new book by H. H. Katz, AIRCRAFT DRAFTING, is the work of a man who has trained hundreds of draftsmen for two of our largest aircraft concerns. The book combines two of the most valuable virtues a vocational text can have: it teaches the beginner the principles of drafting in the clearest possible manner, largely through carefully designed illustrations; and it gives him all the practical information about the industrial practices and special aircraft materials and methods that will make him most useful to his employer — information that usually takes long experience to acquire. 386 pages. 8½ x 11. Over 500 illustrations. $5.

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(Continued from page 26A)

schools, Denver, and G. F. Liebendorfer, director, Nebraska State Board for Vocational Education, Lincoln.

The industrial-arts program was as follows:

Friday, 9:45 a.m., "Human Relations in Business and Industry," Dr. R. A. Hinderman, assistant superintendent in charge of secondary schools and adult education, Denver Public Schools.

Friday, 2:00 p.m., "Trends in Industrial Arts," Dr. R. A. Hinderman.

Discussion leaders: Dr. O. A. Hankammer, Pittsburg; J. C. Woodin, Wichita; and J. H. Douglass, Winfield, Kans.

P. W. Chamness, director of vocational education, Topeka, Kans., is the president of the Kansas Industrial Arts Association.

♦ Conferences on testing, sponsored by the Wisconsin Department of Public Instruction, State Board of Vocational and Adult Education, in co-operation with the University of Wisconsin and the vocational and public schools of La Crosse, Madison, Milwaukee, Appleton, and Wausau, were held on October 21, 22, 23, 24, and 25, 1946.

At the morning session of the conference held at Milwaukee on October 25, Irving W. Stout, director of the Division of Pupil Personnel, Milwaukee public schools, was chairman.

Karl U. Smith, assistant professor of industrial psychology, University of Wisconsin, Madison, chose for his address "Why Provide Testing Services in Guidance."

Following him, Clifford P. Froehlich, specialist, Individual Inventory and Counseling Techniques, U. S. Office of Education, Washington, D. C., spoke on "How to Select Tests for Specific Purposes."

The third speaker was Edward J. Pfeifer, case supervisor, State Board of Vocational and Adult Education, Green Bay, Wis. A spirited discussion followed.

The chairman at the afternoon session was William F. Rasche, director and principal, Milwaukee Vocational School.

The first speaker at this session was John P. Treacy, professor of education, Marquette University, Milwaukee. He discussed "Some Limitations in the Use of Tests in Counseling."

Following him, Lewis H. Drake, director of Student Counseling Center, University of Wisconsin, Madison, spoke on "Some Practical Applications of Tests in the Field of Work." A discussion and question period followed.

News Notes

♦ A list of laboratory publications, January 1 to June 30, 1946, can be obtained by writing to the U. S. Forest Products Laboratory, Madison 5, Wis.

♦ Graduate students in a shop training course, directed by Fred J. Schmidt, Jr., at the Ball State Teachers College summer session, Muncie, Ind., were invited by Supt. Robert L. Gilbert, of Cambridge City, Ind., to offer suggestions regarding the reorganization of the Cambridge City general shop. The class spent a day in Cambridge City surveying the shop and local industries. After studying the problem, each student submitted a plan. Miniature cutouts were used to demonstrate the various recommendations.

♦ At the annual co-ordinators' meeting, held at Purdue University last summer, some definite steps were proposed for the promotion of vocational education programs in the state of Indiana by C. E. Rakestraw, Washington, D. C. He outlined a definite procedure for the inauguration and operation of programs in the high schools. He pointed out that 70 per cent of the students are graduated from high school without any definite idea of the outside world in relation to the types of jobs offered or the preparation for them. Mark Stigers, of the Purdue staff, discussed supervisory training and showed its relationship to the entire vocational program. Dennis H. Price, of the Indiana State Teachers College, outlined the laboratory procedure in teaching related subjects, giving the living situation as well as methods of imparting information through actual materials and problems. H. G. McComb, of the Indiana state office, gave the group a historical background of vocational education and of the various laws governing it, together with an explanation of the operation of the reimbursable programs.

♦ "Trees for Tomorrow" is the title of an interesting movie for sound projectors. The picture is a 16mm. or 35mm. sound film, running 18 minutes, and covers American uses of wood, modern utilization of wood, and conservation and protection techniques of the forest industries.

The motion picture booking request should be addressed to American Forest Products Industries, Inc., 1319 Eighteenth St. N.W., Washington 6, D. C.

Other teaching aids obtainable from the same source are: "Paul Bunyan's Quiz," a 52-page booklet containing 225 questions and answers about forests and forest industries, "Where We Grow Our Trees," a 28 by 34-in. map in four colors, "Prevent Forest Fires," a Bambi poster, and "Care Will Prevent Fire," a Smokey poster.

♦ Matters pertaining to surplus aircraft material should henceforth be sent to Headquarters, Army Air Forces, Washington, D. C., Attn.: Director of Information (Office of Civilian Liaison).

♦ A 15-minute, 35mm. slide film and record entitled "The Story of Oil" has been prepared by the Coca-Cola Company, Wilmington, Del., in co-operation with the American Petroleum Institute, Mid-Continent Gas and Oil Assn., and Western Oil and Gas Assn.

Contact the nearest Coca-Cola bottler or the Coca-Cola Company, Wilmington, Del., for a booking of the film.

♦ The number of apprentices in the building trades is continuing to increase, with 67,387 listed at the end of August, William F. Patterson,

(Continued on page 30A)

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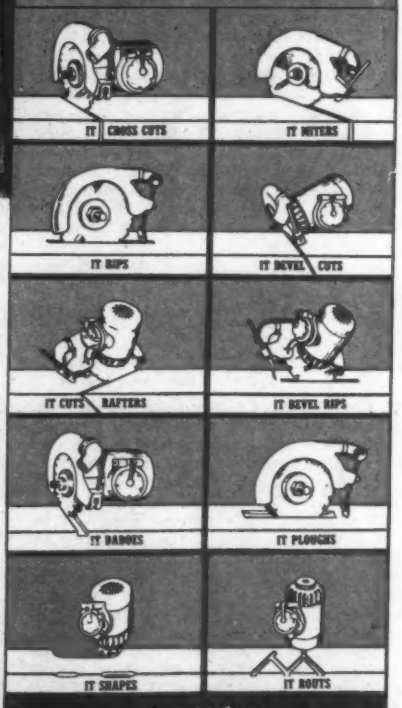

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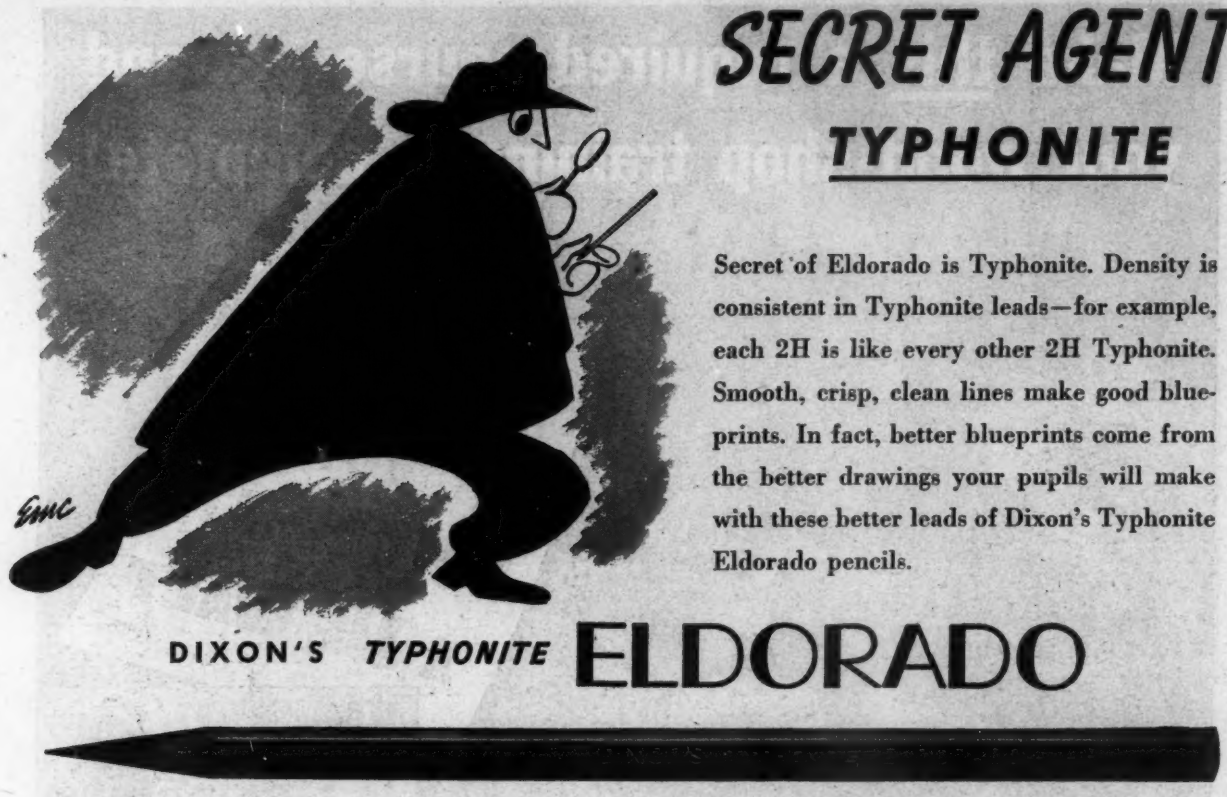
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Secret of Eldorado is Typhonite. Density is consistent in Typhonite leads—for example, each 2H is like every other 2H Typhonite. Smooth, crisp, clean lines make good blueprints. In fact, better blueprints come from the better drawings your pupils will make with these better leads of Dixon's Typhonite Eldorado pencils.
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(Continued from page 28A)

director, Apprentice-Training Service, U. S. Department of Labor, announced recently.

This number represents a gain of 8.9 per cent over the 61,900 on file at the end of July. The August figure is based on 2583 reports received by A.T.S. from its field staff. The total does not represent complete coverage of the United States.

The greatest increase was in the trowel trades (bricklaying, stone masonry, plastering and allied trades, and cement finishing) which showed a jump from 7059 to 8077 for a gain of 14.4 per cent during August. Similar figures for the other building trades follow:

	Reported August 1	*Reported August 31*	*Per cent increase in month*
Electrical	10,453	11,074	5.9
Pipe	8,777	9,318	6.2
Painting	5,635	5,678	0.8
Sheet Metal	4,084	4,199	2.8
Woodworking	23,174	26,162	12.9
Others	2,718	2,879	5.9

♦ The Committee on Consumer Relations in Advertising, 420 Lexington Avenue, New York 17, N. Y., announces the preparation of a series of lessons on "The Consumer-Buyer and Distribution." These lessons are intended to serve as a textbook and lesson plans for schools, colleges, and adult consumer study groups. They will be issued in a series of units composed of one or more lessons each. There will be accompanying questions, problems, projects, and additional reference materials.

The authors have under preparation a teacher's guide which will provide solutions to many of the questions and also offer further suggestions for handling the material in the classroom or before the study group.

♦ The first plant for the manufacture of liquid urea resin adhesives in North Carolina has been opened at Kernersville by the Casein Company of America Division of the Borden Company.

Urea resin adhesives are used extensively in making furniture. Present production of the plant is limited, however, because many of the ingredients used in making urea resin glues are not available. As soon as conditions become more favorable, the output at Kernersville will be increased.

♦ The Chevrolet Motor Division of Detroit, Mich., has announced new rules to govern the construction of soapbox derby cars for the 1947 All-American Soap Box Derby. Changes in the rules concern the construction of steering gear and brakes and new weight and cost limitations. Boys who built cars for the 1946 derby must change them to conform to a rule providing that the back of the seat must be removable for inspection. Ages for the contestants remain the same, 11 to 15 years inclusive. Information may be obtained from Myron E. Scott, national soapbox derby director, Chevrolet Motor Division, General Motors Building, Detroit 2, Mich.

♦ The future of foreign trade is discussed in a new six-page leaflet entitled "Foreign Trade." It is obtainable from Occupational Index, Inc., New York University, New York 3, N. Y.

♦ The H. W. Wilson Company announces the publication of *Biography Index*, Volume 1, Number 1. It is a one-place index to biographical material in books and magazines. It is designed to serve libraries and schools and to meet the needs of reference and research work in the biographical field.

The new index will be published quarterly with a bound cumulation in June of each year. For descriptive literature write to The H. W. Wilson Co., 950–72 University Ave., New York 52, N. Y.

New Publications

The Amazing Electron

By James I. Shannon, S.J. Cloth, 248 pp., 5⅝ by 8¼ in., illus., $4. The Bruce Publishing Co., 540 North Milwaukee St., Milwaukee 1, Wis.

A scientific subject explained in an interesting manner so that the layman can get a good picture of what is encompassed in this infinitesimal particle of matter. X-rays; radioactivity; alpha, beta, gamma, and cosmic rays, are all discussed, as is also that interesting instrument — the electron microscope. The book also contains a glossary on this portion of scientific investigation.

Modern Practical Accounting

By Earl A. Saliers. Cloth, 365 pp., 5¾ by 8⅜ in., $3.50. American Technical Society, Chicago, Ill.

An introductory text for the student of accounting. It discusses thoroughly the uses of accounting, the various types of books used, the entries that have to be made, business procedures and papers, corporation accounting, partnership, partnership accounting, and management and budgeting problems.

Aircraft Woodwork

By Colonel Rollen H. Drake. Cloth, 197 pp., 6⅜ by 9½ in., illus., $3.50. The Macmillan Company, New York, N. Y.

Detailed information for the beginner who essays to become a skilled woodworker in an aircraft factory. The book presents a clear picture of what the woodworker must know and what he must be able to do.

It shows him how to identify and select wood that is suitable to be used on aircraft, how to read the blueprints from which he has to work, tells him about glues and joints, how to do aircraft doping and finishing, and gives him general safety rules.

The book also presents a number of common construction and repair problems. It also contains a glossary of aircraft terms.

You — Triumphant!

By Eugene J. Benge. Cloth, 294 pp., 5¾ by 8½ in., $3. Harper & Brothers, New York and London.

A book aiming to show how one can know himself by self-appraisal and how to keep track of progress made in improving oneself.

It also explains how to gain an understanding of human behavior, how to acquire skill in

(Continued on page 40A)

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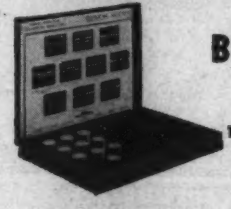

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10 SLIDEFILMS **$39.50**

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AUTOMOTIVE MECHANICAL TRAINING

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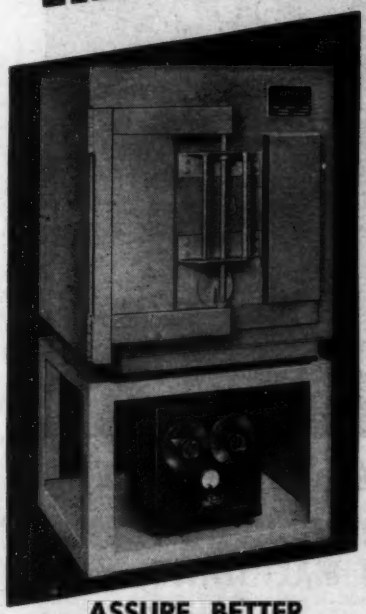


ASSURE BETTER TEACHING PROCEDURE

Harper Electric Kilns provide instructors with sturdy, dependable classroom equipment which can be operated with confidence. They are designed for firing the entire range of clays including the finest porcelains with temperature up to Cone 13; for decorating with enamel and glazes on glassware and metals at low temperatures.

Hinged doors are convenient and easy to operate. Production can be doubled by adding as second kiln and operating it alternately from the same transformer.

Successful firing schedules can be repeated from term to term.

Harper Electric Kilns are proven and approved by schools, industries, and studios.

Write for data.

Harper
ELECTRIC FURNACE CORPORATION
1445 Buffalo Avenue
NIAGARA FALLS NEW YORK

Shop Equipment News

New Products—Publications

HANDY INK-BOTTLE HOLDER

Higgins Ink Co., 271 Ninth St., Brooklyn, N. Y., are releasing a new item—a cardboard bottle base for Higgins ¾-oz. drawing ink desk bottle. The nontip bottle base is a natural adaptation of Higgins color card. The present card-

Handy ink-bottle holder

board novelty is a derivation of the Higgins color card with scored "pie cut" lines which indicate the separation of primary and secondary colors in a wheel. The back of the card bears the same valuable directions which now appear on Higgins standard card and the top of the new card is punched to permit use of a thumbtack to hold the bottle base on inclined drawing boards.

For brief reference use IAVE—1910.

X-ACTO PROTRACTOR AND RULE

X-Acto Crescent Products Co., Inc., have announced a new tool, the X-Acto Protractor and Rule, for use by model builders and craftsmen. This protractor is flexible and useful for measuring angles, transferring angles from plans to

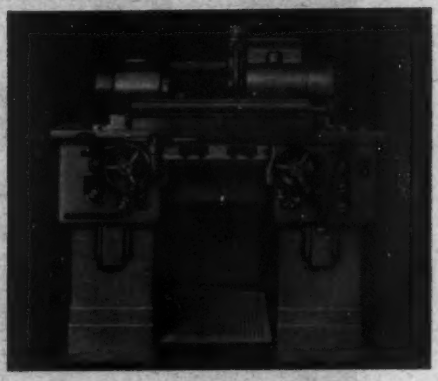
X-Acto protractor and rule

work, for squaring up work, drafting, and other uses. It is a full 180-deg. protractor with a 4-in. diameter and attached to it is a 6-in. scale graduated to sixteenths of an inch. It sells for 75 cents. Complete information is available from the X-Acto Crescent Products Co., Inc., 440 Fourth Ave., New York 16, N. Y.

For brief reference use IAVE—1911.

NEW CINCINNATI FILMATIC HYDRAULIC GRINDING MACHINE

The Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio, have announced a new 4-in. plain hydraulic grinding machine, designed for precise center-type grinding operations on small diameters. This machine is provided with hand or automatic type hydraulic infeed mechanism, which gives the machine unusual productive capacity for either traverse or infeed type operation. The machine is provided with controls conveniently placed and easy to operate. The bed of the machine is a strongly ribbed one-piece casting of box-type construction, with hydraulic oil compartment and coolant reservoir in adjoining compartments in the base.



Cincinnati 4-in. plain hydraulic grinding machine

The table ways are of generous proportions; both hand and power-operated table traverse is supplied; dog-operated table reverse; and automatic pick-feed mechanism is provided. The table is adjustable, under the control of a single adjustable selector knob. For complete information ask for descriptive bulletin from the Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio.

For brief reference use IAVE—1912.

POST 1947 WEEKLY WALL CALENDAR

The Frederick Post Company is announcing its new 1947 Weekly Wall Calendar which will be available for distribution the early part of December. This spiral bound calendar catalog, with engineering data and full 12 months on the back, is 12 by 20 in. in size. The top is printed in five colors, and portrays the draftsman as master of the future. In addition, there are 52 weekly pages, each featuring the various Post products, as also the giant size daily date numerals for each week.

(Continued on page 35A)

New Post calendar

ATKINS
Silver Steel"
CIRCULAR SAWS

Create the Confidence that

CREATES *the* CRAFTSMAN

● You can spot a craftsman at a glance — he's sure of every move he makes. That's the kind of confidence pupils will gain quicker by working with quality tools like Atkins "Silver Steel" Circular Saws. Their faster, easier cutting qualities inspire confidence and speed a student's mastery of his craft. Their tough "Silver Steel" teeth stay keener longer. Their extra ruggedness assures extra years of classroom service. All these are Atkins advantages that make your teaching easier—your results consistently better.

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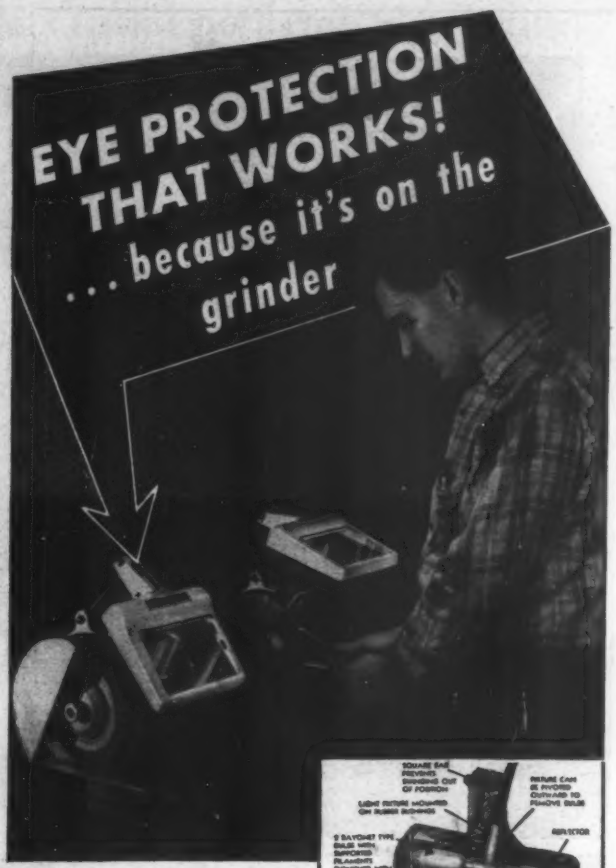
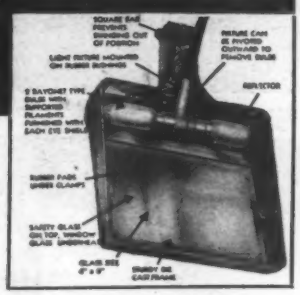
EYE PROTECTION THAT WORKS!
. . . because it's on the grinder





Students like STANLEY "FLUD-LITE" EYE SHIELDS. They're the most comfortable kind of protection from grinding hazards. Nothing to wear—good visibility! Two bulbs with reflector throw light on work. Lights can be connected into grinder circuit to go on when grinder switch is operated. Easily attached to wheel guard of any grinder. Write for details.

STANLEY
Trade Mark

HARDWARE · HAND TOOLS · ELECTRIC TOOLS

MAIL THIS COUPON TODAY

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New Britain, Connecticut IA 1246

Gentlemen: Please send full details on Stanley "Flud-Lite" Eye Shields.

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Title.....
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City..... *State*.....

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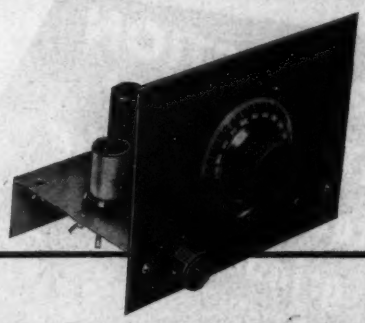

MEISSNER STUDENT KITS

. . . for practical radio instruction at low cost will be again available when present manufacturing conditions permit.

"How To Build" instruction manual, the ideal laboratory textbook, an invaluable reference manual for all radio students. Fifty cents, postpaid (seventy-five cents in Canada)

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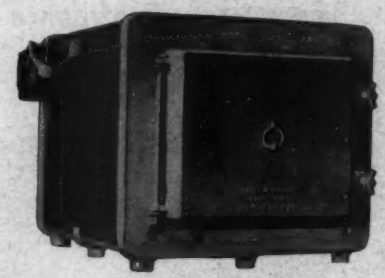
936 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

ELECTRIC POTTERY KILNS

We manufacture over forty types and sizes of electric kilns. All Weldon kilns are strongly made, the result of years of actual use. Fronts and backs cast metal. RIBBON ELEMENTS: built for continuous use.

Tell us the type of pottery you make and we will help you select the proper type and temperature kiln. Art pottery is made at less than 2000F. Stoneware and porcelain may be made at less than 2200F.

Size Inside Baking Chamber Wide High Long	Prices F.O.B. 2315 Harrison	2000F Cone 04	2200F Cone 6
15 x 12 x 18	Bench Type	$300.00	$350.00
15 x 15 x 24	Bench Type	375.00	425.00
18 x 15 x 24	Bench Type	425.00	475.00
15 x 18 x 24	Bench Type	425.00	475.00
18 x 24 x 36	Cabinet	790.00	890.00



15 x 12 x 18 Bench Model

Let us know your kiln needs; we can help you • any size • any temperature

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Your students will find an extra thrill in working with fine plywoods—Mahogany, Curly Birch, Bird's Eye Maple, Havella! They'll put more interest and care into their work—take extra pride in the added beauty of the finished project.

We have available a complete stock of fine plywoods in many standard thicknesses, and in a variety of panel and cabinet grade sizes especially suited for the school workshop. Send today for complete catalog of plywood and craftsmen supplies.

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FOR 94 YEARS!

OHLEN-BISHOP No. 10 Combination

OHLEN-BISHOP saws have almost a century of experience back of them. Our early founders worked closely with the trade designing and building to meet the exacting demands of the saw operators. They've been job-tested through the years; improved and perfected to meet higher and higher speed production. Today, Ohlen-Bishop's stand high in the regard of everyone who has tried and tested them on the job. Next time ask for an OHLEN-BISHOP

OHLEN-BISHOP

SINCE MASTER SAW MAKERS 1885

909 Ingleside Ave. Columbus, Ohio

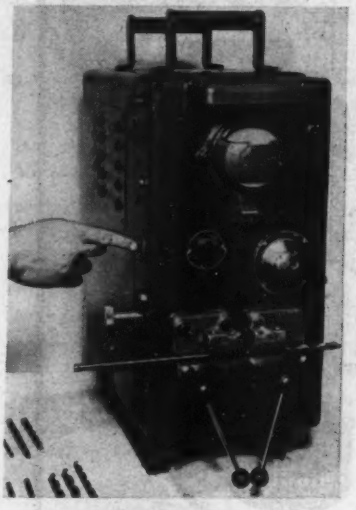
(Continued from page 32A)

For a free copy send to The Frederick Post Co., P. O. Box 803, Chicago, Ill., or to your nearest Post distributor.

For brief reference use IAVE—1913.

NEW AUTOMATIC FLASH-BUTT WELDER

The DoAll Company, 1301 Washington Ave. So., Minneapolis 4, Minn., has announced its new automatic *Flash-Butt Welder*, which provides a quick, economical method of joining metals to produce strong and flexible joints. The welder is designed for production welding of bar and round stock up to $\frac{5}{16}$ in. diameter, and is suitable



DoAll automatic flash-butt welder

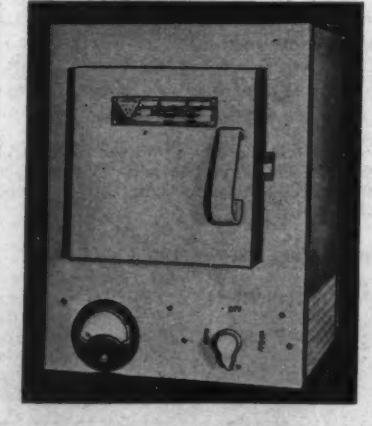
for a variety of uses, including the repair of small tools, butt-welding of tool bit extensions and shanks, and joining of band-saw blades. It offers many timesaving features, is fully automatic, can be used also for annealing and flash dressing, and provides an etching attachment to identify tools, templates, attachments, jigs, fixtures, and dies. It is designed for standard a.c., 220-volt, single-phase 50/60-cycle operation, it comes in either pedestal type, or in a metal carrying case. Information is available upon request.

For brief reference use IAVE—1914.

VERSATILE ELECTRICALLY OPERATED FURNACE KILN

A new Pereco Furnace-Kiln is now obtainable from the Pereny Equipment Co., 893 Chambers Road, Columbus 8, Ohio.

This compact unit, known as Pereco Model 220-W, has working temperatures ranging from 450 up to 2000 deg. F.



New Pereco furnace kiln

Logan A NAME TO REMEMBER WHEN YOU THINK OF BETTER LATHES

Finger Tip Control for Safety, Ease and Speed in Shifting Back Gears

BACK GEARS ENCLOSED IN HEADSTOCK

PLUS PATENTED SHIFTER RACK INCREASES SAFETY AND EFFICIENCY, ADDS TO APPEARANCE OF LOGAN LATHES

Quick Change Gear Lathe

Logan advanced design encloses back gears in the headstock and places the Patented Shifter Rack which controls these gears on the front side of the headstock, at the operator's finger tips. There is no need to reach over the headstock, or to lean forward close to moving parts to shift the back gears. The operator avoids risk and makes the shift more easily and quickly. Here is another example of the practical designing which makes Logan Lathes outstanding in accuracy, speed, durability and safety, and in trim, clean cut appearance. For full information, see your Logan Lathe dealer, or write direct for the Logan catalog.

SPECIFICATIONS COMMON TO ALL LOGAN LATHES . . . swing over bed, 10½" . . . bed length, 43⅛" . . . size of hole through spindle, 25/32" . . . spindle nose diameter and threads per inch, 1½"—8 . . . 12 spindle speeds, 30 to 1450 rpm . . . motor, ½ hp, 1750 rpm . . . ball bearing spindle mounting . . . drum type reversing motor switch and cord . . . precision ground ways, 2 V-ways, and 2 flat ways.

L-2-M

LOGAN ENGINEERING CO. CHICAGO 30, ILLINOIS

It may be used for heat-treating metals, enameling porcelain and jewelry, firing ceramic work, laboratory control work, and applications in plastics and other fields.

It is especially suited to the type of work done in school laboratories and shops. It has four resistance wire-wound embedded elements, drawing 1500 watts at 110 volts. The kiln is furnished with an indicating pyrometer and a 4-step snap switch.

The firm will gladly furnish interested teachers with further information.

For brief reference use IAVE—1915.

STANLEY SAFETY CHARTS

Based on the premise that shop students should become safety conscious as they learn to use tools and machines, Stanley Tools has prepared a new set of 36 safety charts which are now available to schools.

Illustrations for the Stanley Safety Charts are humorous drawings, enlivened by color, and accompanied by brief wordings. Each of these 18 by 12-in. charts gives one complete safety message. The charts are mounted on both sides of heavy cardboard. There are two metal grommets at the top of each chart for suspending them in the classroom. Surfaces of the charts are lacquered, so that they may be cleaned easily.

With the set of 18 cards (36 charts in all), one or two can be displayed in the shop each week, and the series will last for a long time without duplication. Used in this way, they can be the subject of weekly safety discussions.

Stanley Safety Charts are offered at the cost of printing and postage, $2.50 per set anywhere in the U. S. A. (In Canada, the price is $4.10 per set, payable in Canadian funds.) Check should be mailed with order to Stanley Tools, Educational Department, New Britain, Conn.

For brief reference use IAVE—1916.

USE OF MODERN COATED ABRASIVES IN WOODWORKING INDUSTRIES

The educational service department of the Behr-Manning Corporation, Troy, N. Y., has prepared an article entitled "Modern Coated Abrasives in Woodworking Industries," which points out some of the more important developments and improvements during recent years in the manufacture of coated abrasives. This article gives consideration to the importance of woodworking and justifies the emphasis school systems place on teaching this trade. Instructors and supervisors of vocational training who desire a

(Continued on next page)

Light OR Dark
Outstanding designer in the field of fine arts is Fritzi Brod, two of whose imaginative designs, executed in Higgins American India Ink, are here reproduced from her portfolio "200 Motifs and Designs," published by Stephen Daye Press, New York.
Outstanding in the field of fine inks are Higgins American Drawing Inks, endorsed by Miss Brod and countless other notable designers and artists for their character of line, precision and facility of use. Whether your purpose be subtlety or boldness, restraint or vigorous depth, Higgins American Drawing Inks reflect it perfectly, championing your individual skill by their versatility of performance. There are no finer drawing inks than Higgins. Ask your dealer for them.
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THE INTERNATIONAL STANDARD OF EXCELLENCE
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(Continued from previous page)

copy of this paper may make their requests directly to the Behr-Manning Corporation.

For brief reference use IAVE—1917.

AN EFFECTIVE BRUSH CONDITIONER

The Protexem brush conditioner is a novel way of keeping your paint, varnish, enamel, and lacquer brushes in good, workable condition.

The principle upon which this brush conditioner works is ingenious. Protexem uses a liquid the vapor of which attacks the paint or other media in the brush, and cleans it out of even the heel of the brush.

Protexem (1) Softens brushes even if they have been allowed to become as hard as stone. (2) Keeps brushes soft and pliable and always ready for use. (3) Does not damage the bristles in any way. (4) Keeps hardened paint from accumulating in the heel of the brush. (5) Makes brushes last much longer. (6) Saves time wasted in cleaning brushes. (7) Prevents loose bristles. (8) Provides safe storage space for brushes.

Protexem brush conditioner

The vaporing liquid used in Protexem is a balanced mixture of solvents, ½ pint of which will last for several months. Additional vaporing liquid can be bought at very reasonable prices.

For further information, address Wisconsin Laboratories, Inc., 625 N. 23rd St., Milwaukee 3, Wis.

For brief reference use IAVE—1918.

OUTLINE OF ALUMINUM

In an attractive 64-page booklet, Aluminum Company of America, Pittsburgh, Pa., offers teachers of industrial arts and vocational education an interesting story on aluminum, its history, mining, production, and fabrication.

The book presents very useful related material for shop classes. It also contains a set of questions for study. It is available only to teachers.

For brief reference use IAVE—1919.

"GOOD NEIGHBORS"

The Jam Handy Organization, 2900 East Grand Blvd., Detroit 11, Mich., have produced an educational sound film entitled "Good Neighbors." This film gives a complete story of how news is turned into print and what the inside of a newspaper plant looks like. It shows how the different departments and personalities of a publishing organization work together to bring out a paper reflecting the activities, views, and interests of American people.

The film was sponsored by the *Minneapolis Star Journal* and *Tribune* and is narrated by Cedric Adams. The running time is 21 minutes. There is no rental cost to the user except the transportation charges both ways. A 16mm. print of "Good Neighbors" is available upon request.

For brief reference use IAVE—1920.

KURTZ BROS. RECEIVE MERCHANDISING AWARD

At the recent meeting of the National School Service Institute held at the Palmer House in Chicago, Kurtz Bros. of Clearfield, Pa., received the annual award of the advertising committee as the outstanding example of excellence in school supply, advertising, and merchandising during the year 1945. Each year a specific subject for the award is chosen and the subject for 1945 was "The Outstanding Example of Distributor Manufacturer Co-operation."

According to the rules of the contest the trophy changes hands annually, the winner receiving an engrossed certificate of merit which he keeps. If any distributor should be fortunate enough to win the trophy three times, not necessarily in succession, he may keep the trophy. Inauguration of this idea in the National School Service Institute has created considerable friendly competition and generally improved school merchandising.

The subject chosen for 1946 and for which the award will be given during the N.S.S.I. meeting in February, 1947, is "The Catalog Contributing the Most to Better School Supply Merchandising."

Left to right: Robert M. Kurtz, vice-president of Kurtz Bros. Co.; Clarence Maguire, president of Hoover Bros.; winners of the 1944 award; Fred L. Ward, sales manager of Kurtz Bros.; F. Kenneth Halford, Carl A. Soderlund, and Herman A. Obst, sales representatives

DIRECTIONS FOR BUILDING A GAS DRIVE WELDER

The Hobart Brothers Co. offers a new 48-page book entitled "How to Build Your Own Gas Drive Welder." This book takes the reader through a progressive step-by-step plan, showing actual photographs, plans, and ideas for the home builder. Ask for EW-113, available at no charge from The Hobart Brothers Company, Troy 1, Ohio.

For brief reference use IAVE—1921.

CHARACTER... in a textbook

TEACHING THE INDUSTRIAL ARTS

by Emanuel E. Ericson, Professor of Industrial Education, University of California, Santa Barbara, California

Everything of value has character or personality. Textbooks are no exception.

Of all textbooks in industrial-arts education, Ericson's famous teacher-trainer—now completely revised, reset, and expanded in a handsome new 1946 edition—has, it is generally conceded, become known as the strongest, most absorbing, in its evaluation of real, day-by-day problems of teaching and supervision in the school shop.

Marked by clarity, understanding, and breadth of experience. Sure in its analysis of equipment and personnel problems; best possible organization for class use. *Get your order in now for the new Ericson text.* $4.00

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A WHOLE SHOP FULL OF TOOLS IN ONE!

WORKS WOOD, GLASS, METAL, PLASTIC

A precision-built tool for master mechanics and craftsmen. Unsurpassed for grinding, drilling, routing, carving, sawing, finishing and 9,994 other uses. Runs on AC-DC, with more exclusive features than any other tool.

Exclusive finger-grip brings hand closer for finer work.

COMPLETE WITH 35 ACCESSORIES IN FITTED STEEL CASE
$22.50
$31.75 Value If Purchased Separately

CASCO ELECTRI-CRAFT TOOL KIT
CASCO PRODUCTS CORPORATION, BRIDGEPORT 2, CONN.

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THE ONE MACHINE THAT FILES AND JOINTS HAND, BAND AND CIRCULAR SAWS

Nothing is more important to the success of your training program than your saws. Students dull them fast—they need sharpening often.

With a Foley Atuomatic Saw Filer you can sharpen your saws more perfectly than is possible by hand. You can do it quicker,—and your saws will stay sharp longer. Your students will turn out better work with sharp saws. ALSO by keeping your saws sharp with a Foley,—you will easily double their cutting life and have less breakage, reducing replacements to a minimum.

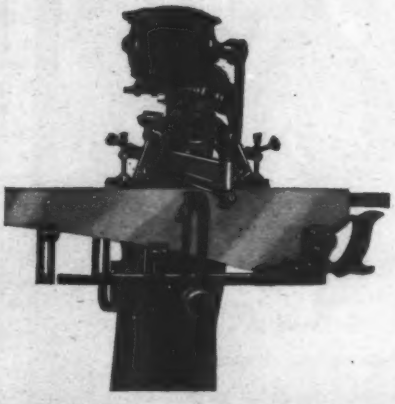
The Foley is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner—stay sharp longer.

Train your students to file saws on a Foley, for they will find thousands of Foley Saw Filers used in industry, Army, Navy, Air Corps, etc. Hundreds of schools and colleges use them to save on saw filing costs and replacement expense.

The FOLEY SAW FILER *Makes...*

an OLD SAW

LIKE NEW!



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Please send literature on the Foley Automatic Saw Filer, and details of your 30-Day Trial.

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Now available, a substantial brick and mill constructed School Building containing 14 large class rooms on 1st and 2nd floors and high, concrete-floor basement. Total area over 30,000 square feet of floor space. Ground area is 125 ft., by 275 ft., located on street car line, close to Union Passenger Station and downtown business district.

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For quick sale $35,000.00, which is 'way below present replacement cost.

Rehabilitation of this property will greatly increase value.

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DURABLE • DEPENDABLE

Precision made, finely balanced Lufkin calipers bring skill to student hands. The same fine, durable tools preferred throughout industry by careful mechanics. Teach good workmanship with good tools—specify Lufkin in your requisitions. Write for free catalog.

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Fine Artist Quality Colors in all mediums, and Related Products.

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3 Farm Equipment Service
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8 Electrical Appliance Service
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10 Arc and Gas Welding
11 Merchandise Display

Prepared by the Wisconsin Vocational Directors Association in cooperation with the Staff of the Wisconsin State Board of Vocational and Adult Education.

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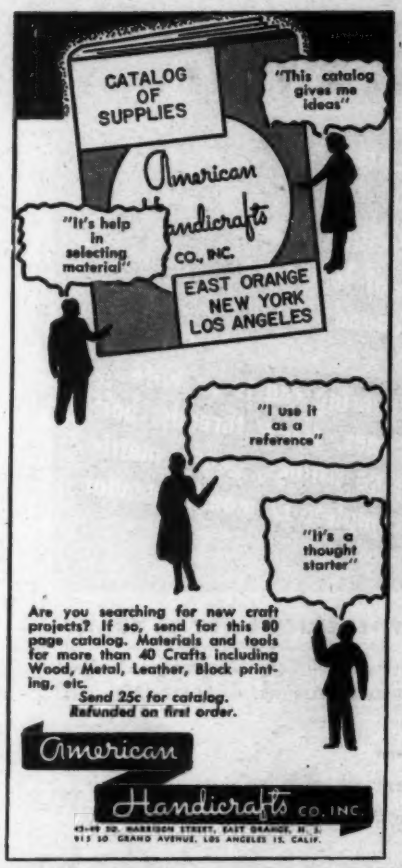
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(Continued from page 30A)

handling others, how to gain contentment and final success.

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United States Department of Labor Bulletins

Obtainable from the Superintendent of Documents, Washington 25, D. C., at 10 cents each.

Bulletin No. 837-1 presents the Employment Opportunities in Aviation Occupations and discusses the employment outlook for the present time.

Bulletin No. 842 is entitled "Employment Outlook for Automobile Mechanics."

Bulletin No. 844 discusses the Employment Opportunities for Welders.

Monographs published by the National Association of Manufacturers, 14 West 49th St., New York 20, N. Y.

"Profit and Loss in the Enterprise System" and "The Role of Prices and Price Determination" are advance copies of Chapters IX and X from the forthcoming book, "The American Individual Enterprise System."

Raising Livestock

By Walter H. Peters and George P. Deyoe. Cloth, 519 pp., 6½ by 9¼ in., illus., $2.60. McGraw-Hill Book Co., New York City.

A textbook for students of agriculture, and animal and poultry husbandry. The book presents clear-cut information on the selection and feeding of livestock; planning and erection of suitable housing as well as the making of necessary equipment; caring for and keeping livestock; breeding and improving hogs, cattle, sheep, horses, and mules; the keeping of suitable records, marketing livestock and livestock products; and the preparation and processing of livestock products for home use.

Farm Mechanics in the Program of Vocational Agriculture

Series A — Bulletin No. 89. Published by the Board for Vocational Education, Springfield, Ill.

A comprehensive booklet on farm mechanics and the farm shop. The book presents floor plans, recommendations for a building, lists of tools and equipment, approximate costs, directions for the care of the building and equipment, how to select subject matter, and the like.

The booklet also contains a valuable list of texts and references.

Subject Headings for the Information File

Compiled by Lois M. Wenman and Miriam Ogden Ball. Paper, 112 pp., 6¼ by 10 in. The H. W. Wilson Co., New York City.

This is the sixth revised edition of the system used by the public library at Newark, N. J.

(Continued on page 42A)

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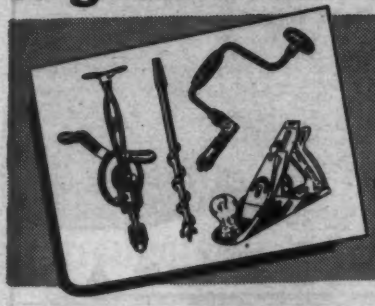

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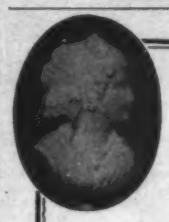

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(Continued from page 40A)

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The points to consider in planning a file, the acquisition of material, the making of source lists of agencies and published materials, the selection and sorting of incoming items, and the assigning of subject headings are all helpfully explained.

Adventures in Scrap Craft

By Michael C. Dank. Cloth, 376 pp., 6¼ by 9¼ in., illus., $4. Greenberg, New York 22, N. Y.

A book which gives suggestions and designs for making numerous projects out of castoff materials in wood, metal, felt, cartons and wallpaper, paper tubes, leather pipe cleaners, and plastics.

Luminous Tube Lighting

By H. A. Miller. Cloth, 143 pp., 5½ by 8¾ in., illus., $3.50. Chemical Publishing Co., Inc., Brooklyn 2, N. Y.

This book gives brief historical sketches about the various gases with which the early experimenters worked until the present neon tubes were perfected. The author also discusses the theoretical considerations involved in the manufacture of this type of lighting equipment, the materials used, the manufacturing equipment needed, and low and high pressure tubes. He also presents data on numerous tests made on lamps of this type.

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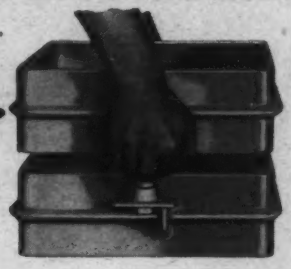

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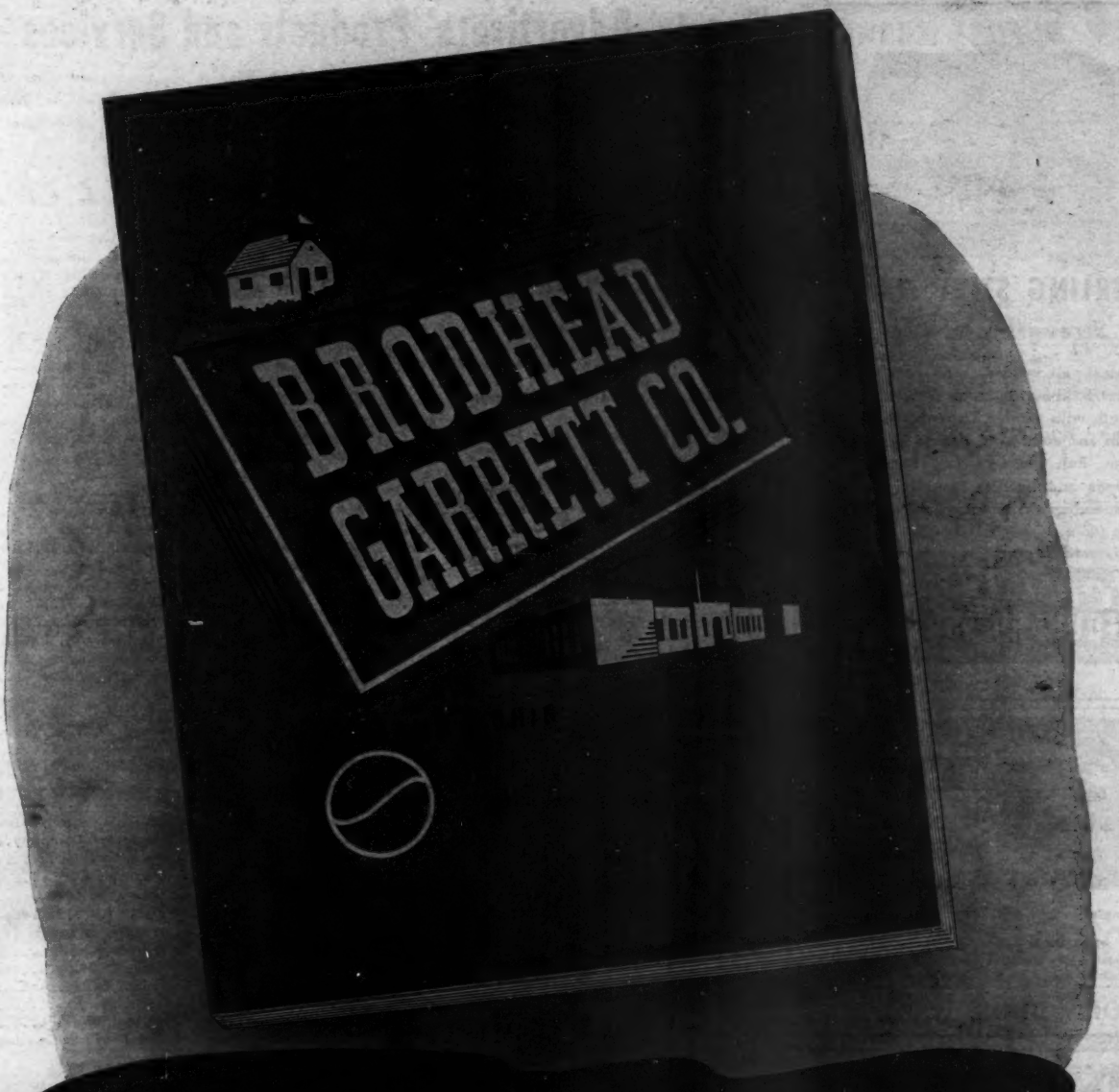

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